

### Applied Research Laboratory

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Technical Report

A THEORETICAL ANALYSIS OF AIRBORNE SOUND TRANSFER FROM A RESILIENTLY MOUNTED MACHINE TO ITS FOUNDATION

by

M. F. Shaw C.B. Burroughs



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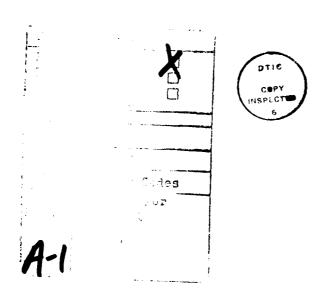
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#### NOMENCLATURE

C	speed	of	acoustic	wave	propa	gation
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- D bending rigidity
- E modulus of elasticity
- f frequency (Hz)
- F input force

#### G(r/r<sub>s</sub>) Green's function

- h thickness of the plate
- i square root of -1
- k acoustic wavenumber or stiffness
- $\mathbf{k}_{\mathbf{p}}$  free bending wavenumber in the infinite plate
- $L_x$  length of plate A in the x direction
- $L_{V}$  length of plate A in the y direction
- x<sub>0</sub>, y<sub>0</sub> drive point on plate A
- z distance between plates
- w plate response
- $\gamma$  ratio of specific heats = 1.4 for air
- $\eta$  damping factor
- μ viscosity of fluid
- v Poisson's ratio
- ρ density
- ω frequency (rad/s)
- ω<sub>0</sub> resonance frequency

#### Chapter 1

#### INTRODUCTION

Resilient mounts are often used to reduce the propagation of unwanted vibration from a machine to its foundation or to reduce the transmission of motion of a foundation to vibration sensitive equipment. Most research on and development of resilient mounting systems has focused on the structureborne paths through the mounts. The often neglected airborne path between the vibrating machine and foundation is considered in this thesis by developing an analytic model for the airborne propagation of vibrations from a finite elastic plate to a parallel infinite plate. In the model, the unsteady pressures generated by vibration of the upper plate are propagated to the surface of the infinite plate where the incident unsteady pressures excite the infinite plate into vibration. The airborne transmission loss is then computed as the ratio of the amplitudes of the vibrations of the two plates.

A simple diagram of a mounting system using four rubber mounts is shown in Figure 1.1. Using four-pole parameters as developed by Molloy (1), the transmissibility of vibration from a vibrating rigid body foundation with uniform velocity to an unconstrained mass is given by

$$T = \frac{v_2}{v_1} = \frac{i\omega \frac{C}{m} + \omega_0^2}{i\omega \frac{C}{m} + \omega_0^2 - \omega^2} ,$$

where the undamped natural frequency is given by

$$\omega_0 = \sqrt{\frac{k}{m}}$$

and

C = 4 times the damping factor for one mount

k = 4 times the stiffness of one mount

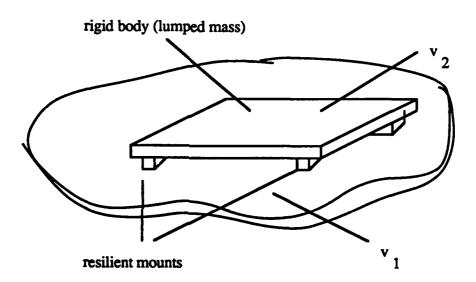


Figure 1.1 Simple diagram of a mounting system

m =the mass of the mounted item.

Using equation 1.1, the vibration transmission losses for propagation through mounts with different natural frequencies are plotted in Figure 1.2. According to equation 1.1, the transmission loss increases indefinitely as one over the frequency squared at frequencies much greater than the natural frequency. However, measurements on single stage mounting systems have rarely shown transmission losses as high as the predicted losses given in Figure 1.2.

There are several reasons why the transmission losses predicted by equation 1.1 are not achieved in reality. Some of these are:

- 1. Structureborne flanking transmission paths through mechanical connections to the mounted machinery, such as piping, electrical connections and duct work.
- 2. Wave effects in the mounts at high frequencies where resonances inside the mounts occur increase the transmissibility through the mounts. This effect has been previously studied; see, for example, Snowdon (2).
- 3. Airborne transmission from the vibrating structure across the mounts to the vibration sensitive structure or equipment.

Because the last effect is often neglected in mount design and because the airborne path may be a significant factor in the transmissibility for single stage mounts at high frequencies, it will be the subject of this thesis.

Heckl (3) measured the vibration transmission loss from a wall to a plate parallel to the wall with and without mounts. The transmission loss was first measured with the plate mounted on rubber mounts having a fundamental resonance of 40 Hz. The mounts were completely removed and the transmission loss measurements repeated with the same distance between the plate and the wall. Figure 1.3 shows the transmission losses

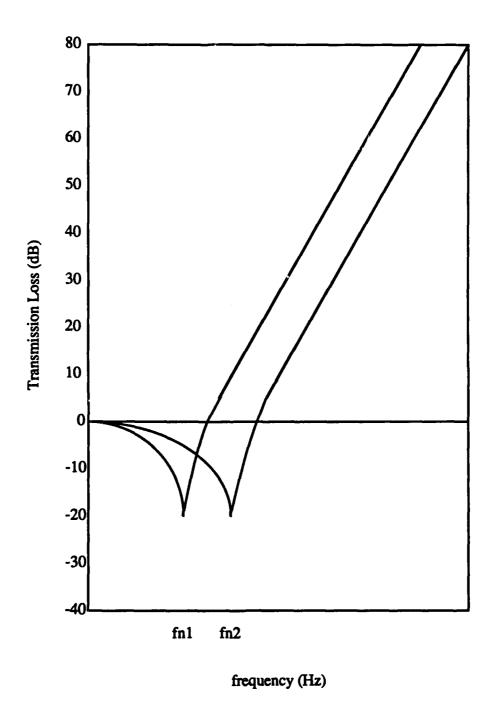


Figure 1.2 Transmission loss for propagation through resilient mounts

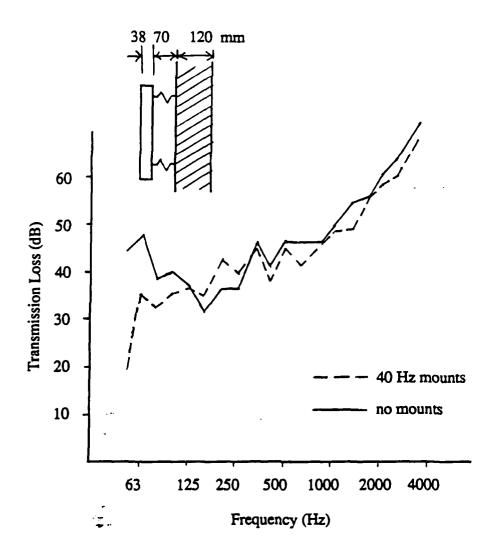


Figure 1.3 Transmission loss for a plate mounted on a wall with and without rubber mounts (3)

between the plate and the wall with and without the mounts. Above 100 Hz, the vibration transmission losses with the mounts are nearly equal to the losses without the mounts. This suggests that energy transmitted between the plate and the wall via the airborne path is nearly equal to the energy transmitted from the plate to the wall via the structureborne path through the mounts.

Ungar (4) treated the air beneath the isolated equipment as adding stiffness to the stiffness of the resilient mounts, thus increasing the stiffness of the mounting system. The resonance frequency of the entire system including the resilient mounts and the entrapped air is:

$$f_n = \left(\frac{1}{2\pi}\right)\sqrt{(k_a + k_s)/m}$$
 1.3

$$= \sqrt{f_a^2 + f_s^2}$$

In the absence of air the resonance frequency  $f_s$  of the mounting system is:

$$f_{S} = \left(\frac{1}{2\pi}\right)\sqrt{k_{S}/m}$$
 1.4

where

k<sub>s</sub> = the static stiffness of the mounts

m = the mass of the mounted item.

Without the mounts, the resonance frequency  $f_a$  of the entrapped air is:

$$f_{a} = \left(\frac{1}{2\pi}\right) \sqrt{k_{a}/m}$$
 1.5

$$k_a = \gamma p_0/d$$

where

k<sub>a</sub> = the stiffness of the air

 $\gamma$  = ratio of specific heats = 1.4 for air

p<sub>O</sub> = the ambient air pressure

d = the air gap thickness

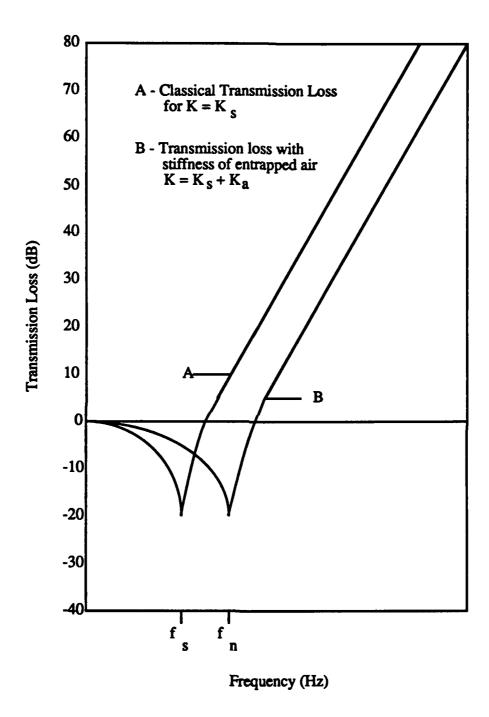


Figure 1.4 Transmission loss taking into account the stiffness of the air beneath the mounted item

Figure 1.4 shows the classical transmission loss curve without the air (curve A) and the transmission loss with the combined stiffness of the mounts and entrapped air (curve B). These curves indicate that the airborne path may be significant in the transmission across resilient mounts.

The results in Figure 1.4 are only valid when the air is entrapped. If the space between the mounted equipment and its foundation is vented, then the inertia and viscosity of the air must be taken into account when calculating the transmission loss. If the air is allowed to escape freely from under the edges of the mounted equipment, the contribution by the air to the total stiffness may be less at low frequencies.

The above analysis does not apply at higher frequencies because it assumes that the base of the isolated equipment moves as a rigid body. At higher frequencies the equipment and foundation no longer behave as rigid bodies.

To include the effects of the venting of air in between the mounted equipment and its foundation, and the elastic vibratory motion of the mounted equipment and foundation, an analytic model for the airborne transmission between parallel elastic plates is developed in this thesis. In Chapter 2, the mathematical model for the response of a finite plate to a point excitation and the airborne transmission loss from the finite vibrating plate to the vibration response of a parallel infinite elastic plate is derived. Predictions of the airborne transmission loss are presented in Chapter 3 and compared to predicted transmission losses through resilient mounts. Also the dependance of the airborne transmission losses on model parameters, such as the separation distance between the plates, thickness of the infinite plate, size of the finite plate, frequency and damping in the plates are presented. Conclusions and recommendations for additional research are given in Chapter 4.

#### Chapter 2

#### ANALYTIC MODEL

#### 2.1. Introduction

In the analytic model of the airborne transmission from a vibrating piece of machinery to its supporting structure, derived here, the foundation (receiver structure) is modeled by an infinite flat plate (plate B) and the machinery (source structure) is modeled as a finite flat plate (plate A) parallel to the surface of the receiving structure as shown in figure 2.1. In developing this model, the following steps are taken.

- 1. The solution for the response of the top simply supported plate (plate A) to a point excitation is derived using classical modal expansion.
- 2. Euler's equation is used to relate the velocity of plate A to the unsteady pressure on the surface of plate A facing the infinite plate (plate B).
- 3. Using the wave equation, the pressure on the surface of plate A is propagated to the surface of plate B.
- Fourier transforms are used to transform the pressure on the surface of plate
   B into wavenumber space.
- 5. Using the Green's function for plate B in wavenumber space, the solution for the response of plate B to the pressure on its surface is obtained as the product of the Green's function and the pressure on the surface of plate B.
- 6. The inverse Fourier transform is taken to obtain the spatial distribution of the response of plate B.
- 7. Predictions of the transmission loss are derived by taking the ratio of the averages of the vibration responses computed for plates A and B.

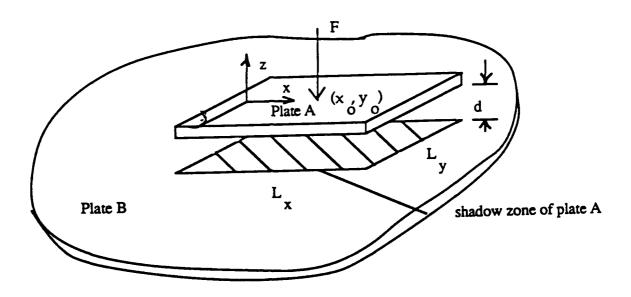


Figure 2.1 Infinite flat plate with a finite flat plate parallel to it

#### 2.2. Assumptions

One of the assumptions in the development of the analytic model is that the impedances of the plates are much larger than the acoustic impedance of the air. With this assumption, a) the effect of air loading on the vibration of plate A will be neglected, b) the response of plate A to pressure radiated by plate B back to plate A will be neglected, and c) the pressure on the surface of plate B will be the "blocked" pressure, i.e. the motion of plate B will have little impact on the pressure on the surface of plate B. Therefore, with the impedances of the plates much larger than the acoustic impedance, the solution for plate vibrations decouple from the air pressures. Also standing waves in between the two plates will not be included in the model.

#### 2.3. Mathematics

#### 2.3.1 Vibration Response of Plate A

For Plate A, simply supported, and driven by a point source located at  $x_0$  and  $y_0$  as shown in figure 2.1, the plate equation is

$$D_a \nabla^4 w_a - \rho_a h_a \omega^2 w_a = F \delta(x - x_0) \delta(y - y_0) , \qquad 2.1$$

where the bending rigidity of plate A is given by

$$D_a = \frac{E_a h_a^3}{12(1-v^2)}$$
 2.2

where  $\rho_a$  is the density of plate A,

ha is the thickness of plate A,

E<sub>a</sub> is the modulus of elasticity of plate A, and

v is Poissons ratio.

For a simply supported plate the boundary conditions are:

$$\begin{cases} w_a = 0 \\ \frac{\partial^2 w_a}{\partial x^2} = 0 \end{cases} \text{ for } x = \pm L_x/2$$

and

$$\frac{\partial^2 w_a}{\partial y^2} = 0$$
for  $y = \pm L_y/2$ 
2.3

With opposing edges simply supported, the solution is separable, so that

$$\mathbf{w}_{\alpha}(\mathbf{x},\mathbf{y}) = \mathbf{X}(\mathbf{x})\mathbf{Y}(\mathbf{y}) \quad . \tag{2.4}$$

To satisfy the boundary conditions given by equations 2.3,

$$X(x) = \cos \left[ \frac{(2m+1) \pi x}{L_x} \right]$$

$$Y(y) = \cos \left[ \frac{(2n+1) \pi y}{L_y} \right] . \qquad 2.5$$

The solution can then be expressed as

$$w_a(x,y) = \sum_{m=0}^{\infty} \sum_{n=0}^{\infty} A_{mn} \cos \left[ \frac{(2m+1) \pi x}{L_x} \right] \cos \left[ \frac{(2n+1) \pi y}{L_y} \right] . 2.6$$

2.9

The resonant frequencies  $\omega_{mn}$  are obtained by using equation 2.6 in the homogeneous equation 2.1,

$$\omega_{\rm mn}^2 = \frac{D_a}{\rho_a h_a} \left\{ \left[ \frac{(2m+1)\pi}{L_{\rm x}} \right]^2 + \left[ \frac{(2n+1)\pi}{L_{\rm y}} \right]^2 \right\}^2$$
 2.7

Now using equation 2.6 in equation 2.1, and operating with

$$\int\limits_{-Lx/2}^{Lx/2} \int\limits_{-Ly/2}^{Ly/2} \cos \left[ \frac{(2m'+1) \pi x}{L_x} \right] \cos \left[ \frac{(2n'+1) \pi y}{L_y} \right] dx dy$$

and using orthogonality yields

$$A_{mn} = \frac{4 F \cos \left[ \frac{(2m+1)\pi x_0}{L_x} \right] \cos \left[ \frac{(2n+1)\pi y_0}{L_y} \right]}{M_p [\omega_{mn}^2 - \omega^2]}$$
2.8

where  $M_p = \rho_a h_a L_x L_y$ .

Using equation 2.8 in equation 2.6,

$$\frac{4F}{M_{p}} \sum_{m=0}^{\infty} \sum_{n=0}^{\infty} \frac{\cos \left[ \frac{(2m+1)\pi x_{0}}{L_{x}} \right] \cos \left[ \frac{(2n+1)\pi y_{0}}{L_{y}} \right] \cos \left[ \frac{(2m+1)\pi x}{L_{x}} \right] \cos \left[ \frac{(2n+1)\pi y}{L_{y}} \right]}{\left[ \omega_{mn}^{2} - \omega^{2} \right]}.$$

Taking the Fourier transform of equation 2.9

$$w_{\mathbf{a}}(\mathbf{k}_{\mathbf{x}}, \mathbf{k}_{\mathbf{y}}) = \frac{4F}{M_{\mathbf{p}}} \sum_{m=0}^{\infty} \sum_{n=0}^{\infty} \frac{\cos \left[\frac{(2m+1)\pi x_{0}}{L_{\mathbf{x}}}\right] \cos \left[\frac{(2n+1)\pi y_{0}}{L_{\mathbf{y}}}\right]}{\left[\omega_{mn}^{2} - \omega^{2}\right]} I_{mn}(\mathbf{k}_{\mathbf{x}}, \mathbf{k}_{\mathbf{y}}) \qquad 2.10$$

where

$$I_{mn}(k_x,k_y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \cos\left[\frac{(2m+1)\pi x}{L_x}\right] \cos\left[\frac{(2n+1)\pi y}{L_y}\right] e^{-ik_x x} e^{-ik_y y} dx dy . 2.11$$

 $I_{mn}(k_x,k_y)$  is evaluated in Appendix A.

#### 2.3.2. Acoustic Field Between Plates

The unsteady pressure in the air between plate A and plate B satisfies the wave equation which, for harmonic time dependence e<sup>-iωt</sup>, becomes the Helmholtz equation,

$$\nabla^2 \mathbf{p} + \mathbf{k}^2 \mathbf{p} = 0 2.12$$

where  $k = \frac{\omega}{c}$  is the acoustic wavenumber.

Taking the Fourier transform of equation 2.12 yields

$$(k^2 - k_x^2 - k_y^2 + \frac{\partial^2}{\partial z^2}) p (k_x, k_y; z) = 0$$
 2.13

The solution to equation 2.13 is

$$p(k_x,k_y;z) = A e^{i(k^2-k_x^2-k_y^2)^{1/2}z}$$
 . 2.14

At the surface of plate A, the velocities of the air and the plate are equal, so that, from Euler's equation with harmonic time dependence, we have

$$\rho_0 \omega^2 w_a = \frac{\partial p}{\partial z} \quad ]_{z=0} \quad . \tag{2.15}$$

Taking the Fourier transform yields

$$\rho_0 \omega^2 w_a(k_x, k_y) = \frac{\partial}{\partial x} p(k_x, k_y; z) \quad ]_{z=0} \quad . \tag{2.16}$$

Using equation 2.14,

$$A = \frac{-i\rho_0 \omega^2 w_a(k_x, k_y)}{(k^2 - k_x^2 - k_y^2)^{1/2}} .$$
 2.17

So that equation 2.14 for the pressure radiated by plate A in wavenumber space becomes

$$p(k_{x},k_{y};z) = \frac{-i\rho_{0}\omega^{2}w_{a}(k_{x},k_{y})}{(k^{2}-k_{x}^{2}-k_{y}^{2})^{1/2}}e^{i(k^{2}-k_{x}^{2}-k_{y}^{2})^{1/2}z}.$$
 2.18

Using equation 2.10 in equation 2.18,

$$p(k_{x},k_{y};z) = \frac{-i4F\rho_{0}\omega^{2}}{M_{p}(k^{2}-k_{x}^{2}-k_{y}^{2})^{1/2}}e^{i(k^{2}-k_{x}^{2}-k_{y}^{2})^{1/2}z}$$

$$\sum_{m=0}^{\infty}\sum_{n=0}^{\infty}\frac{\cos\left[\frac{(2m+1)\pi x_{0}}{L_{x}}\right]\cos\left[\frac{(2n+1)\pi y_{0}}{L_{y}}\right]}{\left[\omega_{mn}^{2}-\omega^{2}\right]}I_{mn}(k_{x},k_{y}). \quad 2.19$$

This is the pressure radiated by plate A into a free space, as a function of wavenumber,  $k_x$  and  $k_y$ , at a distance z from the plate. The pressure driving plate B will be the "blocked" pressure which is twice the free-field pressure given in equation 2.19.

#### 2.3.3. Vibration Response of Plate B

The response of plate B to the pressure on its surface is given by

$$w_b(x',y') = 2 \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} p(x,y;d) G(x',y'/x,y) dx dy$$
, 2.20

where  $w_b(x',y')$  is the velocity of plate B, p(x,y;d) is the free field pressure at the surface of plate B, d is the separation distance between the plates, and G(x',y'/x,y) is the Green's function which satisfies

$$D_b \nabla^4 G - \rho_b h_b \omega^2 G = \delta(x - x') \delta(y - y') \qquad . \tag{2.21}$$

Equation 2.21 is the classical plate equation with harmonic time dependence and pressure of unit amplitude acting on the plate at the point x',y'. Therefore, for the infinite plate, plate B, the Green's function, G(x',y'/x,y) is the velocity of the plate at x', y' due to a unit force applied at a point x,y. Since the plate is infinite, the Green's function depends only on the separation between the point source and the receiver, and not on each location. Equation 2.20 can be written as:

$$w_b(x',y') = 2 \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} p(x,y;z) G(x-x',y-y') dx dy$$
 2.22

Equation 2.22 is the convolution integral and its Fourier transform is

$$w_b(k_x,k_y) = 2 p(k_x,k_y;z) G(k_x,k_y)$$
 . 2.23

For an infinite plate, it can be assumed in equation 2.21 that x' = y' = 0, so that

$$D_{b}\left(\frac{\partial^{4}}{\partial x^{4}} + 2\frac{\partial^{4}}{\partial x^{2}\partial y^{2}} + \frac{\partial^{4}}{\partial y^{4}}\right)G - \rho_{b}h_{b}\omega^{2}G = \delta(x)\delta(y) \qquad .$$
 2.24

Taking Fourier transforms on x and y, and solving for the Green's function yields

$$G(k_x, k_y) = \frac{1}{D_b[(k_x^2 + k_y^2)^2 - k_p^4]}$$
2.25

where  $k_p^4$ , the free structural wavenumber, is given by

$$k_p^4 = \frac{\rho_b h_b}{D_h} \omega^2 \quad . \tag{2.26}$$

Using equations 2.19 and 2.25 in equation 2.23, yields

$$w_{b}(k_{x},k_{y}) = \frac{-i8F\rho_{o}\omega^{2}}{M_{p}} \frac{e^{i(k^{2}-k_{x}^{2}-k_{y}^{2})^{1/2}z}}{D_{b}[(k_{x}^{2}+k_{y}^{2})^{2}-k_{p}^{4}](k^{2}-k_{x}^{2}-k_{y}^{2})^{1/2}}$$

$$\sum_{m=0}^{\infty} \sum_{n=0}^{\infty} \frac{\cos\left[\frac{(2m+1)\pi x_{o}}{L_{x}}\right] \cos\left[\frac{(2n+1)\pi y_{o}}{L_{y}}\right]}{[\omega_{mn}^{2}-\omega^{2}]} I_{mn}(k_{x},k_{y}) . \qquad 2.27$$

Taking the inverse Fourier transform, yields the final solution for the response of plate B,

$$\begin{split} w_b(x,y) &= \frac{-i8F\rho_0\omega^2}{(2\pi)^2M_pD_b} \sum_{m=0}^{\infty} \sum_{n=0}^{\infty} \frac{\cos\left[\frac{(2m+1)\pi x_0}{L_x}\right] \cos\left[\frac{(2n+1)\pi y_0}{L_y}\right]}{\left[\omega_{mn}^2 - \omega^2\right]} \\ &\int\limits_{-\infty}^{\infty} \int\limits_{-\infty}^{\infty} \frac{e^{i(k^2-k_x^2-k_y^2)^{1/2}z} I_{mn}(k_x,k_y)}{\left[(k_x^2+k_y^2)^2-k_p^4\right](k^2-k_x^2-k_y^2)^{1/2}} e^{ik_x^2} e^{ik_y^2} dk_x dk_y \\ &= 2.28 \end{split}$$

Equation 2.28 has three singularities; one at the resonance frequencies of plate A,  $\omega_{mn} = \omega$ , one at the acoustic wavenumber in the air between the plates,  $k^2 = k_x^2 - k_y^2$ , and one at the free bending wavenumber in plate B,  $k_p^4 = (k_x^2 + k_y^2)^2$ . In order to solve this equation these singularities must be addressed.

At resonance frequency, the response of plate A becomes infinite because there is no damping in the model. In reality, there is always some damping, which is added to the model by making the bending rigidity of plate A complex,

$$D_a^* = D_a (1+i\eta_a)$$
 , 2.29

where  $\eta_a$  is the damping loss factor of plate A.

The singularity at the acoustic wavenumber results from taking a Fourier transform over the infinite spatial domain of plate B. With no dissipation, the acoustic pressure waves in the air will propagate parallel to plate B out to infinity, so that energy will sum to infinity when a sum is taken over all space in the infinite Fourier transform. In reality, there will be some dissipation of the acoustic energy propagating parallel to plate B. Also, energy that propagates parallel to plate B should couple less to the response of plate B then energy that propagates directly across the space between the plates and is incident on plate B at non-grazing angles. Therefore dissipation can be added to the acoustic propagation to make the model more realistic and remove the singularity at the acoustic wavenumber, without impacting the results at non-acoustic wavenumbers.

Pierce (5 eqn. 10-8.9b) gives the acoustic wavenumber with absorption as:

$$\mathbf{k}^* = \frac{\omega}{c} + i\alpha_{cl}' \quad , \qquad 2.30$$

where the classical absorption constant is given by (from Pierce (5 eqn.10-2.12))

$$\alpha_{cl}' = \frac{\omega^2}{c^3} \frac{\mu}{2\rho_0} \left( \frac{4}{3} + \frac{\mu_B}{\mu} + \frac{\gamma - 1}{Pr} \right)$$
 2.31

where  $\mu$  is the viscosity of air,

 $\rho_0$  is the density of air,

 $\mu_B$  is the bulk viscosity of air,

 $\gamma$  is the ratio of specific heats = 1.4 for air, and

Pr is the Prandtl number for air.

Ignoring effects of bulk viscosity ( $\mu_B$ ) and using equation 2.31 in equation 2.30,

$$k^* = k \left\{ 1 + i \left[ \frac{\omega}{c^2} \frac{\mu}{2\rho_0} \left( \frac{4}{3} + \frac{\gamma - 1}{Pr} \right) \right] \right\}$$
 2.32

Equation 2.32 was used for the acoustic wavenumber in equation 2.28.

The singularity at the free bending wavenumber in plate B can be removed by adding damping to the plate in a manner similar to the damping added to plate A. This damping has the same effects as the dissipation added to the air between the plates. With damping, the bending wavenumber can be written as

$$(k_p^*)^4 = k_p^4 (1+i\eta_b)$$
 , 2.33

where  $\eta_{\boldsymbol{b}}$  is the damping loss factor of plate B.

To evaluate the integral in equation 2.28 using numerical methods, a two dimensional discrete inverse Fourier transform was developed based on the continuous infinite inverse Fourier transform as defined by Brigham (6),

$$f(x,y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} F(k_x,k_y) e^{ik_x x} e^{ik_y y} dk_x dk_y . \qquad 2.34$$

This integral is approximated by limiting the range of integration, so that

$$f(x,y) = \int_{-K_x/2}^{K_x/2} \int_{-K_y/2}^{K_y/2} F(k_x,k_y) e^{ik_x x} e^{ik_y y} dk_x dk_y , \qquad 2.35$$

where  $K_x$  and  $K_y$  are at least twice the value of  $k_p$  as calculated from equation 2.26 or twice the acoustic wavenumber k which ever value is larger at the frequency of interest. These limits were selected so that the range of integration includes all of the points where singularities would exist in the absence of added damping and dissipation and so that the exponential term  $e^{i(k^2-k_x^2-k_y^2)^{1/2}}$  decays to a small number at the limits of integration. Equation 2.35 can be written

$$f(x,y) = e^{-ixK_x/2} e^{-iyK_y/2} \int_0^{K_x} \int_0^{K_y} F(k_x - K_x/2, k_y - K_y/2) e^{ik_x x} e^{ik_y y} dk_x dk_y.$$
2.36

This integral can be evaluated using the rectangular rule with spacing  $h_{kx} = \frac{K_x 2\pi}{N}$  and  $h_{ky} = \frac{K_y 2\pi}{N}$  so

$$f(x,y) \approx \frac{1}{(2\pi)^2} e^{-ixK_x/2} e^{-iyK_y/2} h_{kx} h_{ky}$$

$$\sum_{m=0}^{N-1} \sum_{n=0}^{N-1} e^{ixmh_{kx}} e^{iynh_{ky}} F(mh_{kx} - K_x/2, nh_{ky} - K_y/2) . \qquad 2.37$$

By setting  $x = \frac{2\pi j_x}{K_x}$  and  $y = \frac{2\pi j_y}{K_y}$  where  $j_x = 0,1,...N-1$  and  $j_y = 0,1,...N-1$ . Equation 2.37 becomes

$$f(\frac{2\pi j_x}{K_x}, \frac{2\pi j_y}{K_y}) = \frac{1}{(2\pi)^2} (-1)^{j_x} (-1)^{j_y} h_{kx} h_{ky}$$

$$\sum_{m=0}^{N-1} \sum_{n=0}^{N-1} e^{i\frac{(2\pi)^2 j_\chi m}{N}} e^{i\frac{(2\pi)^2 j_\chi n}{N}} F(mh_{kx} - K_\chi/2, nh_{ky} - K_y/2) .$$

2.38

Thus, after scaling by the factors  $\frac{1}{(2\pi)^2}$  (-1)  $^jx$  (-1)  $^jy$   $h_{kx}h_{ky}$ , the discrete inverse Fourier transform given by equation 2.38 approximates the continuous inverse Fourier transform given by equation 2.35.

To calculate the plate response, the infinite summation in equation 2.28 can be solved by starting the summation at the resonance frequencies,  $\omega_{mn}$  which are nearest the frequency of interest. With this approach, the summation converges more rapidly than beginning with the lowest mode numbers. This is seen by observing equation 2.28. When a resonance frequency is chosen which is not near the resonance frequency of interest, the  $(\omega_{mn}^2 - \omega^2)$  term in the denominator becomes large and the contribution to the sum becomes small. When solving equation 2.28 an iterative process was used. The

summation was taken using the resonance frequencies near the frequency of interest until the contribution to the summation became negligible. The same process can be used to solve the infinite summation in equation 2.9.

#### 2.3.5. Transmission Loss between Plate A and Plate B

Transmission loss is given by

$$TL = 10 \log_{10} \frac{(A_A)^2}{(A_B)^2}$$
, 2.39

where  $A_A$  is the average of the magnitude of the velocity of plate A vibration, computed from equation 2.9 and  $A_B$  is the average of the magnitude of the velocity of plate B vibration, computed from equation 2.28.

For purposes of computation, the transmission loss for the vibration response of plate B is computed in the shadow zone of plate A as illustrated in Figure 2.1. By computing the vibration amplitude at N points on plate A and M points on plate B, the transmission loss is determined using the following equation:

$$TL = 10 \log_{10} \frac{\frac{1}{N} \sum_{i=1}^{N} (A_A^i)^2}{\frac{1}{M} \sum_{j=1}^{M} (A_B^j)^2}$$
 2.40

N and M are chosen so that there are three points per wavelength at the highest frequency.

#### Chapter 3

#### RESULTS

The equations developed in the previous chapter are used to predict airborne transmission losses for plate configurations which are representative of typical machine/ foundation arrangements. Table 3.1 shows the input values used in the equations. For various input parameters, surface plots of the displacements of plates A and plate B were obtained to show the motion of the plates and graphs of airborne transmission loss between plates A and B as a function of frequency are presented.

#### 3.1. Surface Plots

Figures 3.1 through 3.6 are surface plots of the motion of plates A and B for various frequencies and damping. These surface plots are essentially a snap shot of the displacement of the plate. The surface plots for plate A were obtained using equation 2.9 in a FORTRAN computer program. The surface plots for plate B were obtained using equation 2.28 in a FORTRAN computer program. The discrete inverse Fourier transform as described in equation 2.38 was used to solve the integral part of equation 2.28.

In Figures 3.1 through 3.6 the figure with the "a" suffix is the surface plot of plate A and the figure with the "b"suffix is the surface plot of plate B. The x and y ordinates are the dimensions of the plate in meters (m). The vertical axis is the amplitude of displacement of the plate in meters. The parameters used to make the predictions presented in Figures 3.1 through 3.6 are listed in Table 3.1 and shown on the surface

Table 3.1

Input parameters for calculation of surface plots and transmission loss curves

Parameters of Finite Plate (Plate A)

dimensions of plate.....
$$L_x = 1.0 \text{ m}$$
  $L_y = 1.0 \text{ m}$ 

driving point.....
$$x_0 = 0.0 \text{ m}$$
  $y_0 = 0.0 \text{ m}$ 

driving force.....
$$F = 1.0 N$$

plate thickness.....
$$h_a = 0.001587 \text{ m}$$

plate density......
$$\rho_a = 7860.0 \text{ kg/m}^2$$

modulus of elasticity.....
$$E_a = 200 \times 10^9 \text{ N/m}^2$$

bending rigidity......
$$D_a = 72.73 \text{ N/m}$$

damping coefficient.....
$$\eta_a = 0.001$$

Parameters of Infinite Plate (Plate B)

plate density......
$$\rho_b = 7860.0 \text{ kg/m}^2$$

modulus of elasticity.....
$$E_b = 200 \times 10^9 \text{ N/m}^2$$

bending rigidity.....
$$D_b = 72.73 \text{ N/m}$$

damping coefficient.....
$$\eta_b = 0.001$$

Parameters for Fluid (Air)

density......
$$\rho_b = 1.204 \text{ kg/m}^2$$

viscosity.....
$$\mu = 0.0000184 \text{ kg/ms}$$

speed of sound...... 
$$c = 343.0 \text{ m/s}$$

Prandtl number......
$$Pr = 0.706$$

specific heat ratio.....
$$\gamma = 1.4$$

plots. Surface plots were generated for a low resonant frequency, a low non-resonant frequency and a high resonant frequency, for both high and low damping. Plate A is a square plate with a sinusoidal force of 1 Newton (N) (0.2248 lb.) applied in the center. Both plates are steel. The edges of plate A are at zero amplitude as required by the simple supports at the edges.

Figures 3.1, 3.2, 3.3, and 3.4 show plate A and plate B excited at 37.93 Hz which from equation 2.7 is the n=0, m=1 resonant mode of plate A. In figures 3.1 and 3.2 both plates are highly damped ( $\eta_a = \eta_b = 0.1$ ) and in Figure 3.3 and 3.4 both plates are lightly damped ( $\eta_a = \eta_b = 0.001$ ). Comparing Figures 3.1 and 3.3 it can be seen that the amplitude of the undamped plate A is much larger than the highly damped plate A. This illustrates the well known effect of damping at reducing the resonant response of structures. Comparing the responses of the damped and undamped plate A (Figures 3.1 and 3.3), it can be seen that the mode shapes are the same even though the maximum amplitude of the plate vibration is different.

The symmetry of the waves excited in plate B and propagating outward from the shadow zone of plate A can be seen clearly in Figure 3.2. In this figure, the exponential decay due to damping can also be seen. The amplitude of the waves in the middle of plate B directly beneath the top plate is large and the waves decay exponentially as they spread towards the edge of the plate. In Figure 3.4 for the lightly damped plate B it can be seen that the plate is fully excited. Also, because of the decrease in the amplitude of vibration of plate A, the vibration of plate B in the shadow zone is lower with high damping than with low damping.

Figures 3.5, 3.6, 3.7, and 3.8 show plate A and plate B excited at 110 Hz, which is not a resonance frequency of plate A. It is between the m = 2, n = 0 resonance at 98 Hz and the m = 2, n = 1 resonance at 129 Hz. The mode shape of the damped and undamped plate A (Figures 3.5 and 3.7) are similar to each other. The

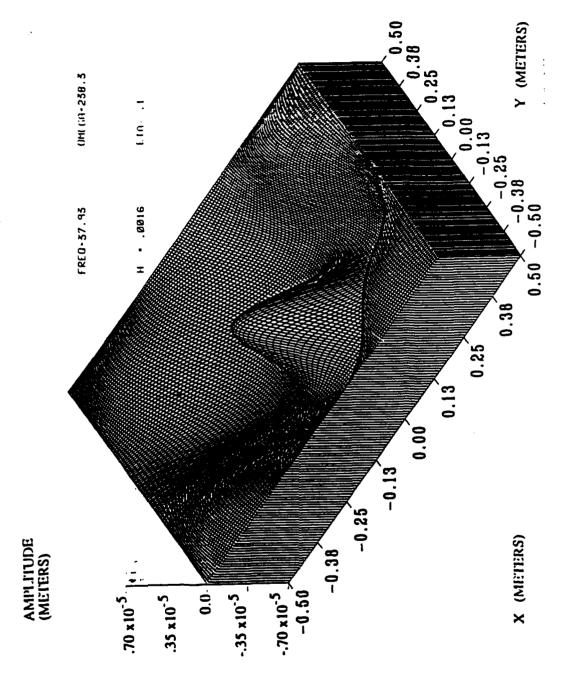


Figure 3.1 Plate A, low resonance, high damping (f=37.9Hz and  $\eta = 0.1$ )

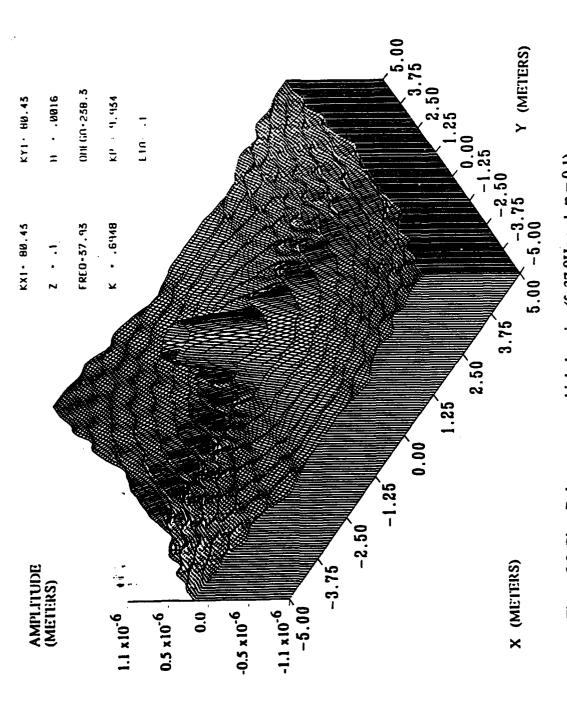


Figure 3.2 Plate B, low resonance, high damping (f=37.9Hz and  $\eta=0.1$ )

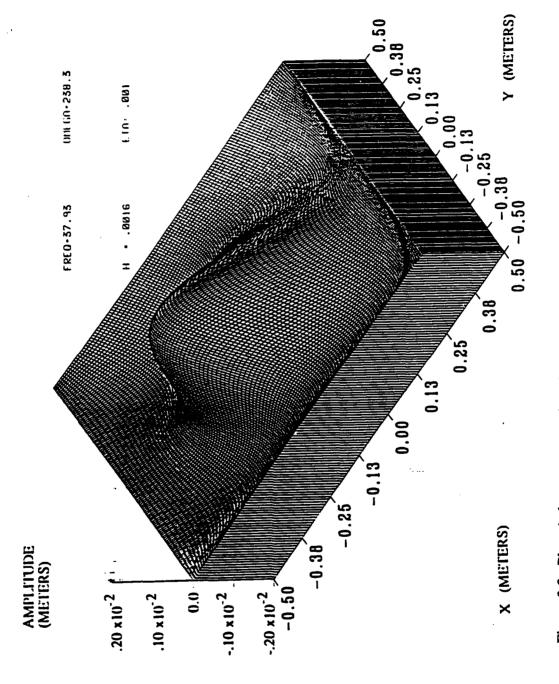


Figure 3.3 Plate A, low resonance, low damping (f=37.9 Hz and  $\eta = 0.001$ )

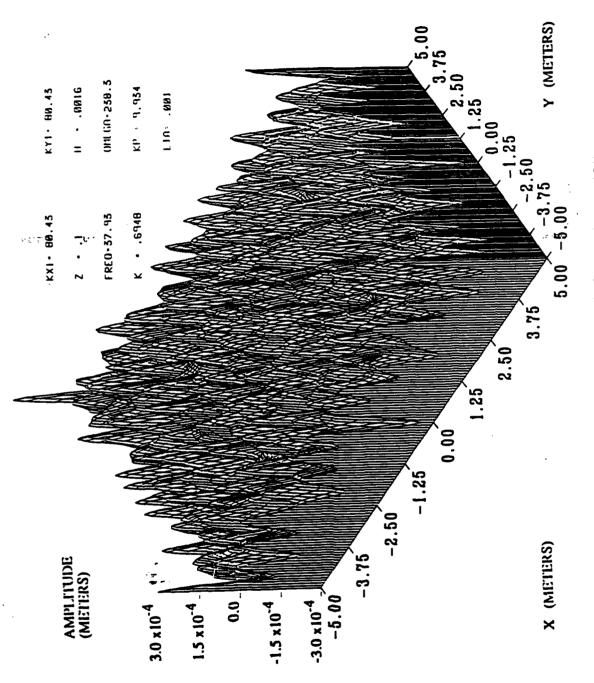


Figure 3.4 Plate B, low resonance, low damping (f=37.9 Hz and  $\eta = 0.001$ )

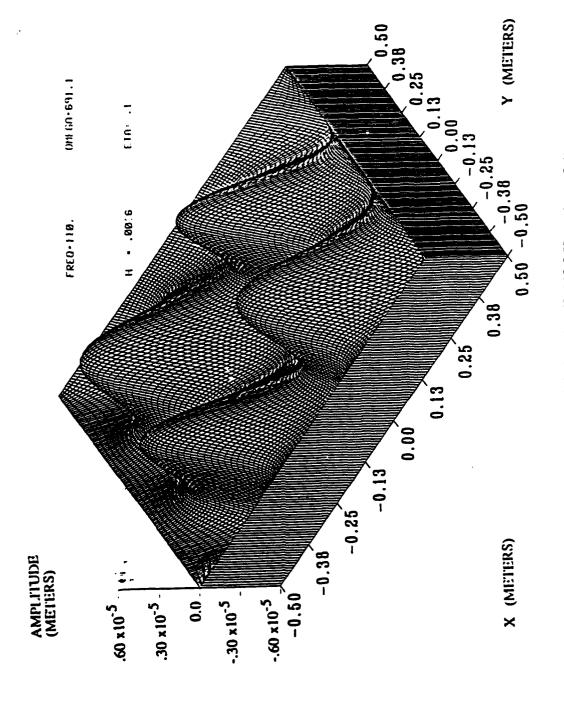


Figure 3.5 Plate A, low non-resonance, high damping (f=110.0 Hz and  $\eta=0.1$ )

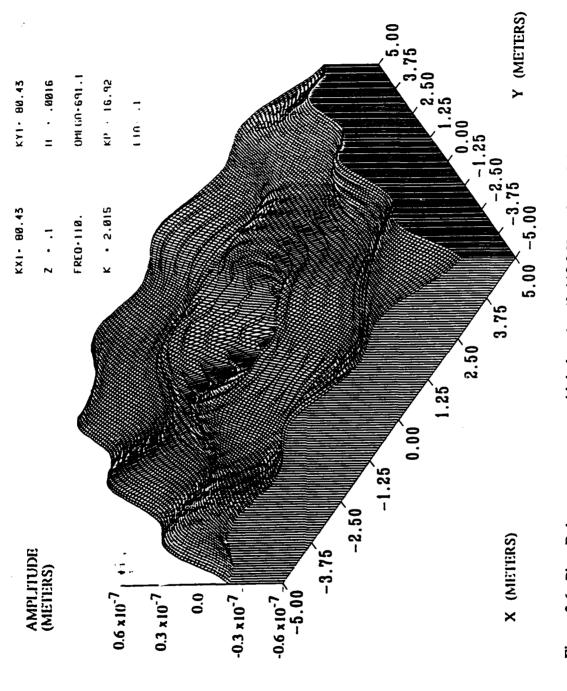


Figure 3.6 Plate B, low non-resonance, high damping (f=110.0 Hz and  $\eta = 0.1$ )

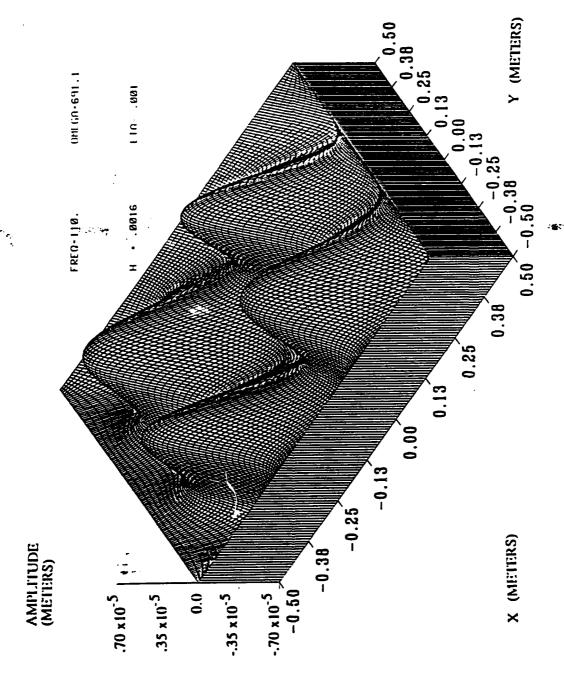


Figure 3.7 Plate A, low non-resonance, low damping (f=110.0 Hz and  $\,\eta$ =0.001)

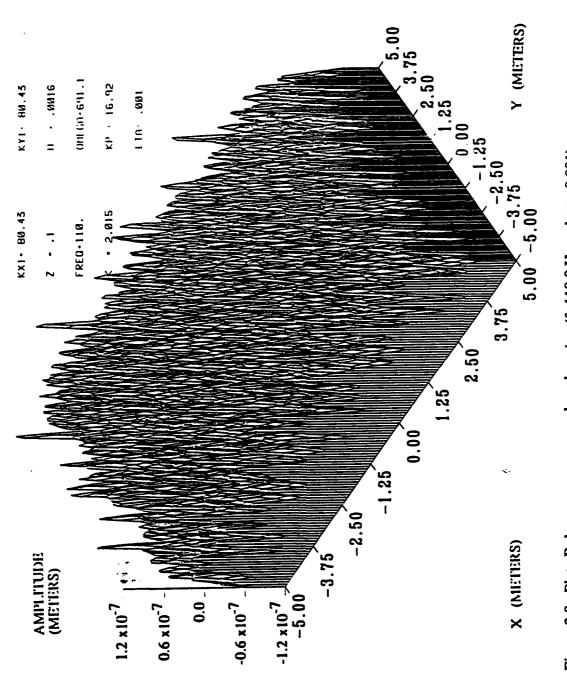


Figure 3.8 Plate B, low non-resonance, low damping (f=110.0 Hz and  $\eta$ = 0.001)

difference between the amplitudes of the damped and undamped plate A is not as great as at the resonance frequency (Figures 3.1 and 3.3). This is because damping in the plate is less effective at reducing structural response of a structure off resonance than at resonance.

The radial symmetry of the waves excited in plate B can again be seen in Figure 3.6 with the high damping. The exponential decay of the waves toward the edges of plate B produced by the damping can also be seen. The response in the shadow zone shown in Figure 3.6 is negative, opposite that shown in Figure 3.1. Again with light damping, plate B is excited both in and out of the shadow zone, as shown in Figure 3.8.

Figure 3.9 is a surface plot of the inverse Fourier transform of equation 2.19 using the same input values as for Figure 3.1 and 3.2. This is the pressure incident on plate B at a low resonance frequency and high damping (37.9 Hz and  $\eta$ =0.01). It can be seen in this figure that the pressure distribution on plate B closely follows the mode shape of plate A as shown in Figure 3.1. Figure 3.10 is a surface plot of the inverse Fourier transform of equation 2.25 using the same inputs. This is the Green's function of Plate B. Equation 2.23 is the response of plate B and is obtained by combining equations 2.19 and 2.25 and multiplying by 2. Similarly, if each point on Figures 3.9 and 3.10 are combined and multiplyed by 2, the result is Figure 3.2, the response of plate B. Figures 3.11 and 3.12 are the pressure and Green's functions respectively for 110.0 Hz and  $\eta$ =0.1. These two figures can be combined in the same manner to obtain the plate response shown on Figure 3.6. Comparing the pressures shown in Figures 3.9 and 3.11, the effects of the resonant response of the plate on the increase in the pressure incident on plate B in the shadow zone can be seen. At resonance, the incident pressure is higher. Figures 3.10 and 3.12 show the effects of free propagation in the infinite plate outside the shadow zone. At the higher frequency, the wavelength for free propagation is smaller.

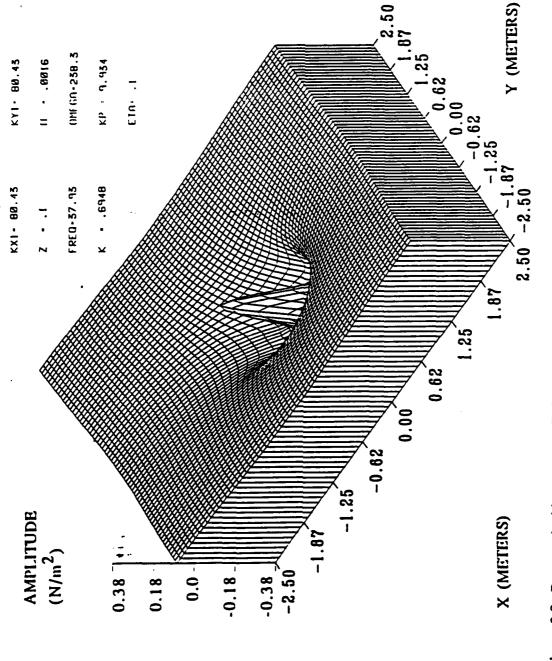


Figure 3.9 Pressure incident on plate B, low resonance, high damping (f=37.9Hz and  $\eta$ =0.1)

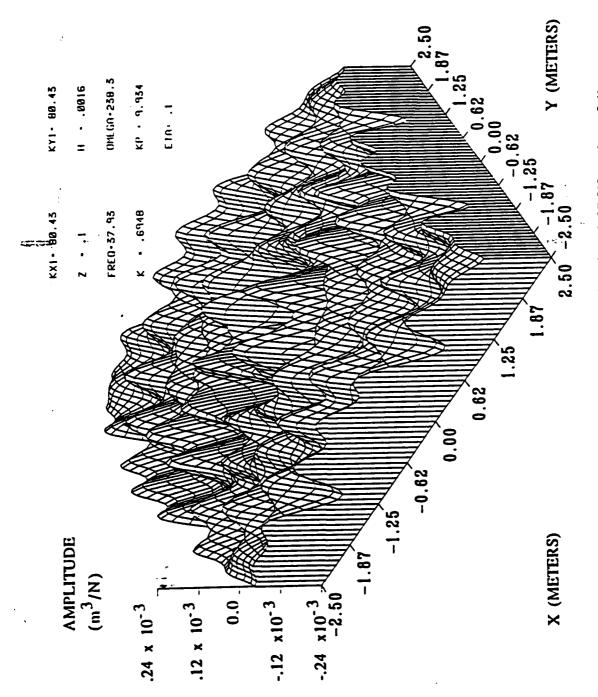


Figure 3.10 Green's function for plate B, low resonance, high damping (f=37.9Hz and  $\eta=0.1$ )

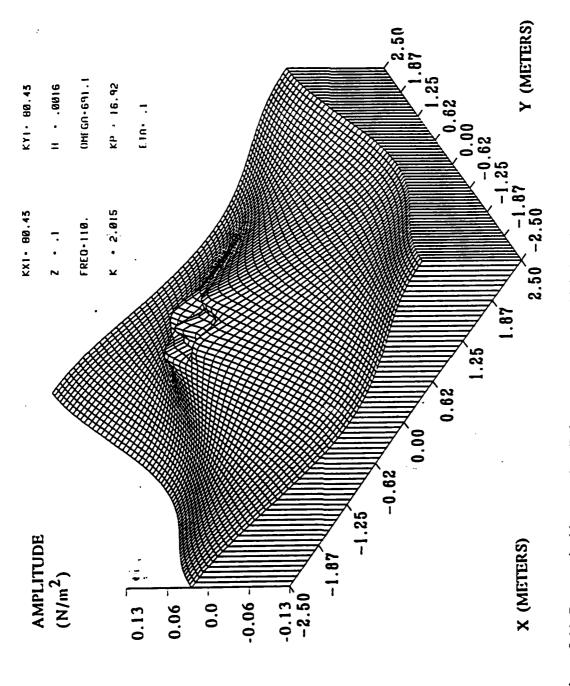


Figure 3.11 Pressure incident on plate B, low non-resonance, high damping (f=110.011z and  $\eta = 0.1$ )

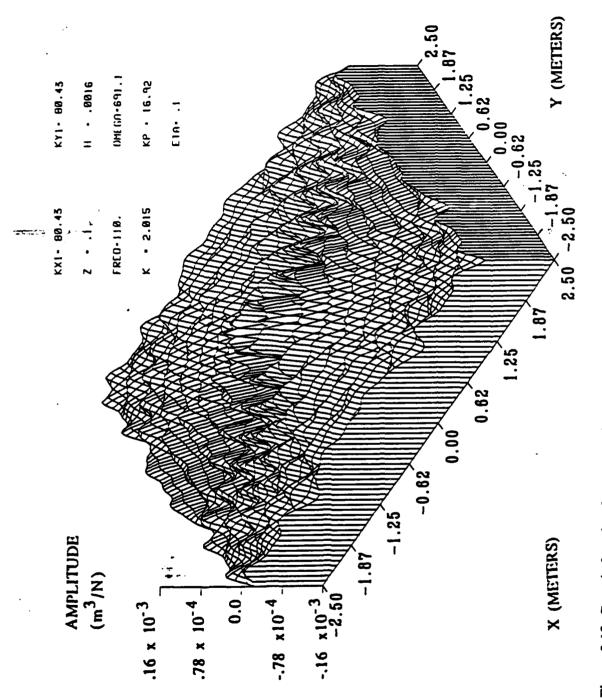


Figure 3.12 Green's function for plate B, low non-resonance, high damping (f=110.011z and  $\eta=0.1$ )

## 3.2. Transmission Loss between plates A and B

Predictions of the motions of plate A and plate B obtained by using equations 2.9 and 2.28 in equation 2.40 to predict the transmission loss in decibels from 10 Hz to 5000 Hz are presented in Figures 3.13 through 3.18. Unless otherwise noted, the parameters listed in Table 3.1 are used, with the separation distance between the plates, the thickness of plate B, the size of plate A, and the damping varied. The values in Table 3.1 were chosen to simulate a typical sub-base and foundation for a medium sized piece of equipment. Also shown in Figures 3.13 through 3.18 is the theoretical transmission loss for simple resilient mounts with a resonance frequency of 5 Hz as computed in equation 2.1 and shown in Figure 2.2. The parameters given by Snowdon (2) for rubber mounts were used in equation 2.1.

In Figure 3.13 the effect on airborne transmission loss of changing the separation distance between the plates from 0.01 m to 0.5 meters is presented. Above 100 Hz all of the curves, except for the curve for 0.5 m, fall below the transmission loss curve for the mounts. This implies that the airborne path would degrade the performance of the isolation system even for the largest separation distances. Increasing the separation distance increases the airborne transmission losses at frequencies between 100 and 1K Hz. Below 100 Hz, the separation distance has little impact on the airborne transmission losses, other than at the frequencies where maxima and minima occur in the transmission loss. The minima in the transmission loss curve below 100 Hz may be due to a resonance associated with the effective masses of the plates and the effective stiffness of the air between the plates. For separation distances greater than 0.05 m, plate B moves out of the acoustic nearfield of plate A at frequencies above 1K Hz, so

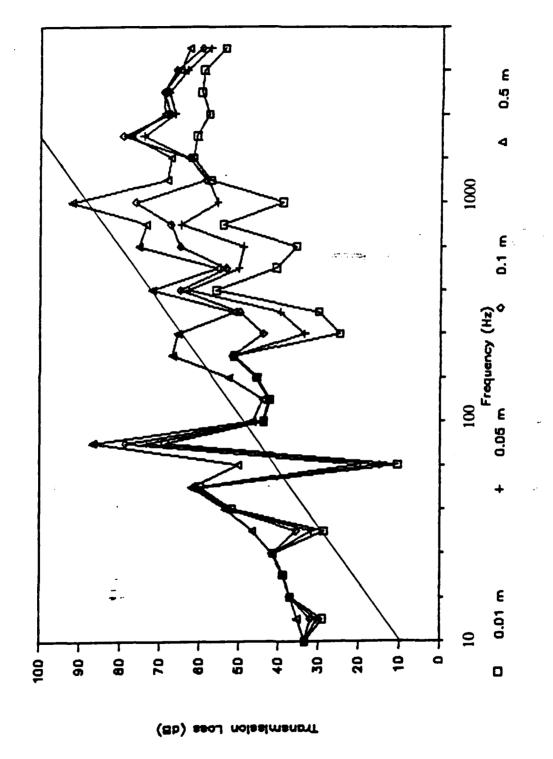


Figure 3.13 Transmission loss curves, changing separation distance between the plates

that the transmission losses above 1K Hz become less sensitive to separation distance than at frequencies below 1K Hz.

In Figure 3.14 the effect on airborne transmission of changing the thickness of plate B from 0.1587 cm (1/16 in.) to 1.27 cm (1/2 in.) is shown. Below 1K Hz, increasing the thickness of the receiver plate increases the airborne transmission losses at all frequencies. Above 100 Hz, the transmission losses for the 0.0157 cm (1/16 in.) thick plate are below the transmission losses for the mounts. Below 1K Hz, the transmission losses for the two thicker plates are above the losses for the mounts. Above 1K Hz, the transmission losses for all three plates are below the losses for the mounts. Increasing the stiffness of the receiving plate by increasing the thickness increases the airborne transmission loss so that the airborne path is not significant at lower frequencies (below 1K Hz); however, at higher frequencies (above 1K Hz) the airborne path remains a problem even when the stiffness of the structure is high.

In Figure 3.15 the size of plate A is changed from 1 m x 1 m to 0.1 m x 0.1 m. Above 100 Hz, the transmission losses for the two larger plates are below the transmission losses for the mounts and above 300 Hz, the airborne transmission losses for the smallest plate is also below the losses for the mounts. Decreasing the area of plate A without changing the separation distance increases the ratio of the area on the sides between the plates available for air to escape to the surface area of plate A and the surface of plate B in the shadow zone. Thus, with the smaller plate, a larger percentage of the energy in between the plates is permitted to escape which increases the airborne transmission losses between the plates at low frequencies. At the higher frequencies, air entrapment becomes less of a factor, decreasing the effect of the size of plate A on the airborne transmission loss. Also the dip and peak in the airborne transmission loss curve for the large (1 m x 1 m) plate are reduced when the size of plate A is decreased. This may be a damping effect produced by an increase in the percentage of the energy

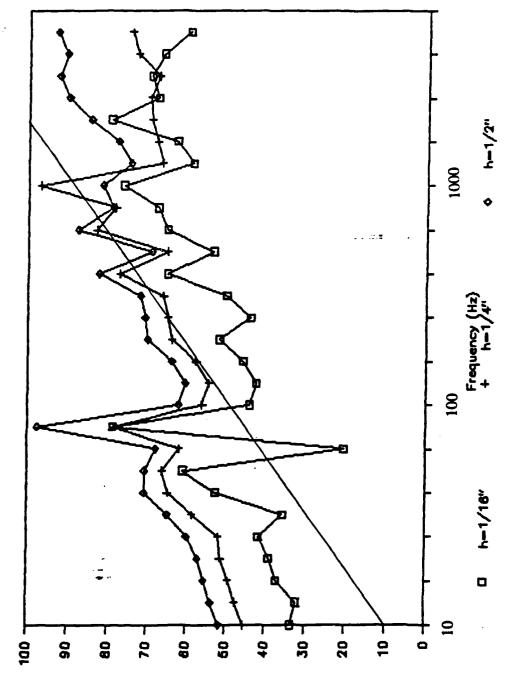


Figure 3.14 Transmission loss curves, changing the thickness of plate B

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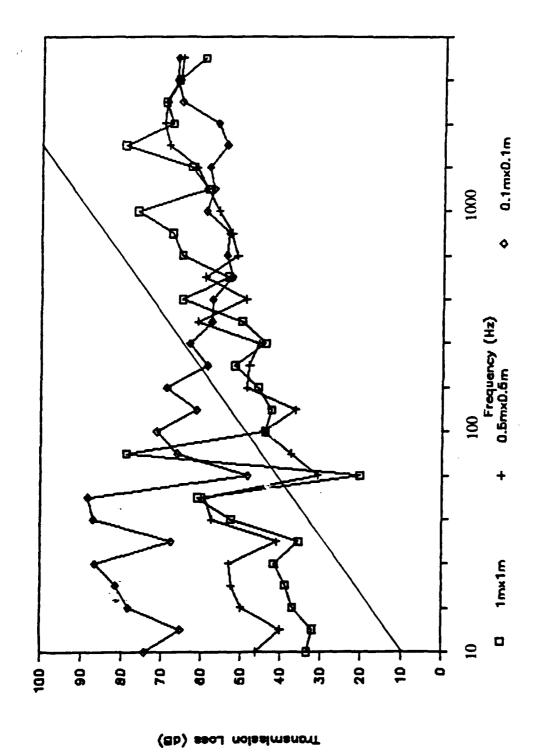


Figure 3.15 Transmission loss curves, changing the size of plate A

between the plates lost to propagation out from between the plates through the openings at the sides of the plates.

In Figures 3.16 and 3.17 the damping in plates A and B was changed for two different separation distances between the plates. In Figure 3.16 the distance between the plates is 0.1 m and the damping is increased from 0.001 (a typical number for an undamped steel plate) to 0.1 (a typical number for steel with damping applied). In Figure 3.17 the distance between the plates is 0.01 m and the damping is varied in the same manner. For both of these graphs the airborne transmission loss curve for the highly damped plate follows the same trend as for the lightly damped plate; however, with damping, the curves are much flatter. This shows the effect of damping which works primarily at resonances. For both separation distances, damping increases the airborne transmission losses at 63 Hz where the airborne transmission loss with light damping is below the transmission loss curve for the mounts. However, above 100 Hz, where the airborne transmission loss curve does not display the effects of resonances, damping has less effect on the airborne transmission losses.

Adding damping to only plate B produced the results shown in Figure 3.18 for a separation distance of 0.1 m. The damping in plate B has an effect only at the frequencies below 100 Hz where a peak and a dip in the airborne transmission loss curve occurs. Again the damping appears to damp the resonant effect that occurs between the plates and the air cushion between the plates.

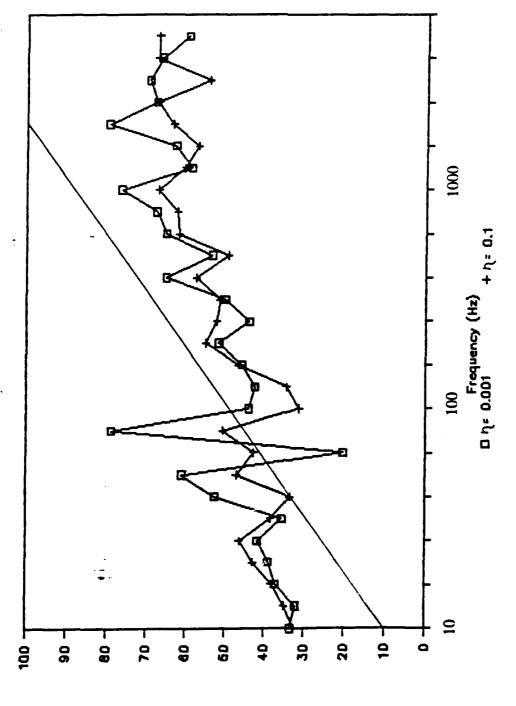


Figure 3.16 Transmission loss curves, changing the damping in plates A and B for a plate separation distance of 0.1 m

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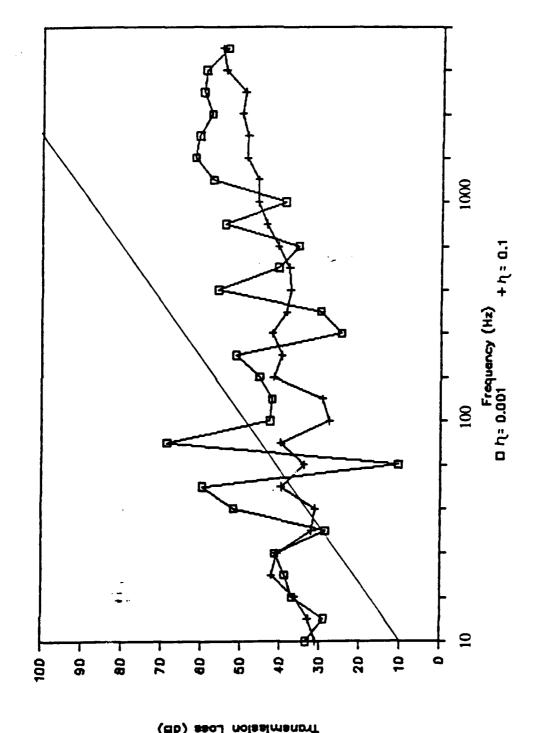


Figure 3.17 Transmission loss curves, changing the damping in plates A and B for a plate separation distance of 0.01 m

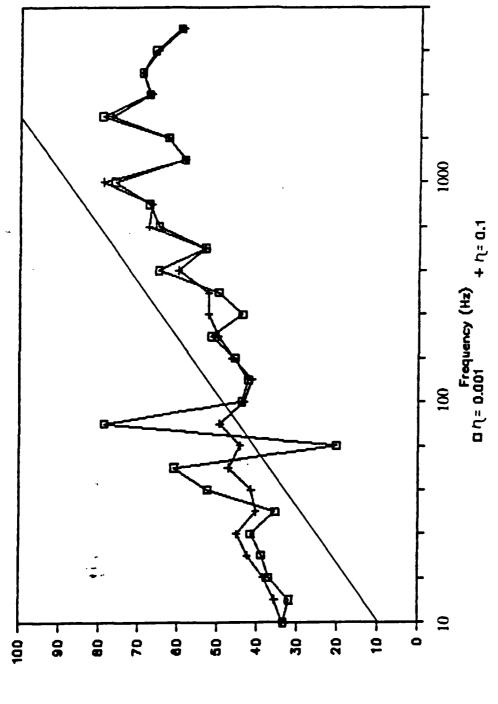


Figure 3.18 Transmission loss curves, changing the damping in plate B for a plate separation distance of 0.1 m

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### Chapter 4

#### CONCLUSIONS

An analytic model for the airborne transmission loss between a vibrating finite plate and a parallel infinite plate was developed. Comparison of the predicted airborne transmission losses with predicted transmission losses for resilient mounts revealed that airborne transmission losses were often less than the losses through the mounts at frequencies above 100 Hz, implying that the airborne transmission path may be significant in many well-designed single-stage resilient mounting systems. Below 100 Hz, the transmission losses through the mounts are below the airborne transmission losses, except at frequencies where resonances between the plates occur.

Increasing the separation distance between the plates, increasing the thickness of the receiver plate and decreasing the size of the source plate increased the airborne transmission losses between the plates. Increasing the damping in the plates was most effective in reducing peaks and dips in the airborne transmission loss curves below 100 Hz.

The basic assumptions used in developing the analytic model are that the impedances of the plates are much larger than the impedance of the air between the plates, there is no feedback from the receiver plate to the source plate and that the pressure generated in the plane, but outside the area, of the source plate has a negligible effect on the airborne transmission losses. In future research, these assumptions should be relaxed, particularly the feedback assumption where standing waves between the plates should decrease the airborne transmission losses. Also, relaxing the small air impedance assumption would increase the coupling between the air and the plates increasing the vibratory response of the plates and decreasing the airborne transmission losses. Experimental verification of the analytic model is needed to certify the conclusion

presented above. Also, experimental and theoretical analysis of treatments to increase the airborne noise transmission losses between structures, such as decoupling coating and damping, is needed.

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Appendix A CALCULATION OF  $I_{mn}$ 

In this appendix, the integral

$$I_{mn}(k_x,k_y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \cos\left[\frac{(2m+1)\pi x}{L_x}\right] \cos\left[\frac{(2n+1)\pi y}{L_y}\right] e^{-ik_x x} e^{-ik_y y} dx dy \qquad A.1$$

as given in equation 2.11 is evaluated.

Since  $\cos\left[\frac{(2m+1)\pi x}{L_x}\right]$  and  $\cos\left[\frac{(2n+1)\pi y}{L_y}\right]$  are even and defined only for  $-L_x/2 \le x \le L_x/2$  and  $-L_y/2 \le y \le L_y/2$ ,

$$I_{mn}(k_x,k_y) = \int_{-L_x/2}^{L_x/2} \cos \left[ \frac{(2m+1)\pi x}{L_x} \right] \cos(k_x x) dx \int_{-L_y/2}^{L_y/2} \cos \left[ \frac{(2n+1)\pi y}{L_y} \right] \cos(k_y y) dy.$$
A.2

When 
$$\left[\frac{(2m+1)\pi x}{L_x}\right]^2 \neq k_x^2$$
 and  $\left[\frac{(2n+1)\pi y}{L_y}\right]^2 \neq k_y^2$ , equation A.2 becomes

$$I_{mn}(k_{x},k_{y}) = \left\{ \frac{\sin\left[\frac{(2m+1)\pi x}{L_{x}} - k_{x}x\right]}{2\left[\frac{(2m+1)\pi}{L_{x}} - k_{x}\right]} + \frac{\sin\left[\frac{(2m+1)\pi x}{L_{x}} + k_{x}x\right]}{2\left[\frac{(2m+1)\pi}{L_{x}} + k_{x}\right]} \right\}_{-L_{x}/2}^{L_{x}/2}$$

$$* \left\{ \frac{\sin\left[\frac{(2n+1)\pi y}{L_{y}} - k_{y}y\right]}{2\left[\frac{(2n+1)\pi}{L_{y}} - k_{y}y\right]} + \frac{\sin\left[\frac{(2n+1)\pi y}{L_{y}} + k_{y}y\right]}{2\left[\frac{(2n+1)\pi}{L_{y}} + k_{y}y\right]} \right\}_{-L_{y}/2}^{L_{y}/2} . A.3$$

Using 
$$\frac{\sin(\alpha)}{\alpha} = \frac{-\sin(-\alpha)}{\alpha}$$
,

$$\sin\left[\frac{(2m+1)\pi}{2} - \frac{k_x L_x}{2}\right] = (-1)^m \cos(\frac{k_x L_x}{2})$$

and

$$\sin\left[\frac{(2m+1)\pi}{2} + \frac{k_x L_x}{2}\right] = (-1)^m \cos(\frac{k_x L_x}{2})$$

in equation A.3,

$$I_{mn}(k_x,k_y) = \frac{4(-1)^{m+n} \frac{(2m+1)\pi}{L_x} \frac{(2n+1)\pi}{L_x} \cos \frac{k_x L_x}{2} \cos \frac{k_y L_y}{2}}{\left\{ \left[ \frac{(2m+1)\pi}{L_x} \right]^2 - k_x^2 \right\} \left\{ \left[ \frac{(2n+1)\pi}{L_y} \right]^2 - k_y^2 \right\}} .$$
 A.4

When 
$$\left[\frac{(2m+1)\pi x}{L_x}\right]^2 = k_x^2$$
 and  $\left[\frac{(2n+1)\pi y}{L_y}\right]^2 \neq k_y^2$ , equation A.2 becomes

$$I_{mn}(k_x,k_y) = \int_{-L_x/2}^{L_x/2} \cos^2\left[\frac{(2m+1)\pi x}{L_x}\right] dx \int_{-L_y/2}^{L_y/2} \cos\left[\frac{(2n+1)\pi y}{L_y}\right] \cos(k_y y) dy.$$
 A.5

Integration of equation A.5 yields

$$I_{mn}(k_x,k_y) = \frac{L_x (-1)^n \frac{(2n+1)\pi}{L_y} \cos \frac{k_y L_y}{2}}{\left[\frac{(2n+1)\pi}{L_y}\right]^2 - k_y^2} .$$
 A.6

Similarly when 
$$\left[\frac{(2m+1)\pi x}{L_x}\right]^2 \neq k_x^2$$
 and  $\left[\frac{(2n+1)\pi y}{L_y}\right]^2 = k_y^2$ , equation A.2 becomes

$$I_{mn}(k_x,k_y) = \frac{L_y (-1)^m \frac{(2m+1)\pi}{L_x} \cos \frac{k_x L_x}{2}}{\left[\frac{(2m+1)\pi}{L_x}\right]^2 - k_x^2} .$$
 A.7

For 
$$\left[\frac{(2m+1)\pi x}{L_x}\right]^2 = k_x^2$$
 and  $\left[\frac{(2n+1)\pi y}{L_y}\right]^2 = k_y^2$ , equation A.2 becomes

$$I_{mn}(k_x,k_y) = \int_{-L_x/2}^{L_x/2} \cos^2 \left[ \frac{(2m+1)\pi x}{L_x} \right] dx \int_{-L_y/2}^{L_y/2} \cos^2 \left[ \frac{(2n+1)\pi y}{L_y} \right] dy, \qquad A.8$$

which, when integrated, yields

$$I_{mn}(k_x,k_y) = \frac{L_x L_y}{4} . \qquad A.9$$

Appendix B
COMPUTER MODEL

In order to solve the equation of motion of both plate A and plate B and to compute the transmission loss between the two plates, three separate computer programs were developed.

Program PRA (Plate Response of plate A) computes the mode shape of plate A. Program PR (Plate Response) computes the response of plate B. Program PRTL (Plate Response - Transmission Loss) computes the transmission loss between plate A and plate B. PRTL is broken down into three parts for three different frequency ranges: PRTL100 for the frequency range from 10 to 100 Hz, PRTL1000 for the frequency range from 100 to 1000 Hz and PRTL5K for the frequency range from 1000 to 5000 Hz. The source code for each of these programs is in Appendix C.

The inputs to all of these programs are taken from the same input file format. A sample input and its corresponding input variables are included in Appendix C. Not all of these inputs are used in each of the programs. See the corresponding write up below for which variables are needed for each program.

#### B.1. Program PRA

This program solves equation 2.9 to obtain the mode shape of plate A. The inputs to this program are:

Lx and Ly Dimensions of plate A

Xo and Yo The point where the input force is applied to plate A

ROA Density of plate A

ACHA Thickness of plate A

ETAA Damping coefficient for plate A

EA Modulus of Elasticity of plate A

The output from this program is a surface plot of the mode shape of plate A. The plotting program used to obtain these plots is a subroutine called ARL\_HIDE and is available on the ARL Penn State VAX computer.

#### B.2. Program PR

This program uses equation 2.28 to obtain the vibration response of plate B to excitation by airborne transmission from plate A. The integral portion of equation 2.28 is solved using a 2-dimensional discrete inverse fast Fourier transform program called F2T2B in the IMSL subroutine library, also available on the ARL Penn State VAX computer. In equation 2.28 this is an infinite 2-dimensional integral; however, in order to solve this integral using the computer the finite integral is approximated by a finite series using equation 2.38.

The choice of wavenumber range (KX1 and KY1) and the sample rate determines the size of plate B by the following equations,

$$x = \frac{2N}{KX1} \qquad y = \frac{2N}{KY1}$$
 B.1

where x and y are the dimensions of plate B.

The wavenumber range must be chosen judiciously with respect to the frequency of interest because of the relationship of the wavenumber and frequency in equation 2.28. At lower frequencies a lower wavenumber range can be used, therefore a larger area of plate B can be observed using equation B.1. At higher frequencies a higher wavenumber range must be used and a smaller area of plate B can be observed using the

same sampling rate (N). A higher sampling rate will solve this problem however, the computer time also increases.

The inputs to this program are:

Lx and Ly Dimensions of plate A

Xo and Yo The point where the input force is applied to plate A

ROA Density of plate A

ROB Density of plate B

ACHA Thickness of plate A

ACHB Thickness of plate B

ETAA Damping coefficient for plate A

ETAB Damping coefficient for plate B

EA Modulus of Elasticity of plate A

EB Modulus of Elasticity of plate B

Z Distance between the plates

PRA Prandel number for the fluid

GAMMA Specific heat ratio for the fluid

MU Viscosity of the fluid

NU Poison's ratio

C Speed of sound in the fluid

RO Density of the fluid

KX1 Upper wavenumber limit in the x direction

KY1 Upper wavenumber limit in the y direction

The output of this program is a surface plot of the vibration response of plate B.

ARL\_HIDE is also used to obtain these plots.

## B.3. Program PRTL

Program PRTL uses the same algorithms used in programs PRA and PR to obtain the motions of plates A and B. Equation 2.40 is then used to obtain the transmission loss between the two plates in the shadow zone of plate A.

This program has been broken down into three parts; PRTL100, PRTL1000 and PRTL5K in order to change the sampling rate and wavenumber range for the frequency range covered by each PRTL program.

The input to these programs are the same as for program PR.

The output from these programs is a table of transmission losses as a function of frequency.

# Appendix C FORTRAN COMPUTER PROGRAMS

```
PROGRAM PRA
  PLATE RESPONSE OF PLATE-A, FINITE PLATE
   WRITTEN BY MICHAEL F SHAW
          INTEGER OMEGAI, OMEGAB, OMEGAT, INC, EM, EN, N, I, J,
      £N1,N2,N11
  NSHOULD BE A PRODUCT OF SMALL PRIMES
         PARAMETER (N-128)
          COMPLEX DSTAR, OMEGAMNSQ, B(N, N), BT(N, N), WA(N, N), WA2(N, N),
      ABT2(N.N)
         REAL VMAX, VMIN, VINC, WAREAL(N+1, N+1), WORK1(4000), WORK2(100)
         REAL DA, ETAA, ETAB, LY, LY, ROA, ROB, ACHA, ACHB, WAZREAL(N+1, N+1)
      4KX1, KY1, F, MP, XO, YO, NU, PI, OMEGA, GAMMA, RO, MU, C, EA, EB, 2,
      LOMEGAL, OMEGANO, OMEGAMNI, OMEGAMN2
         INTRINSIC CMPLX
                                      *********
     *************
                       VARIABLE LIST
C
    DA - BENDING RIGIDITY OF THE FINITE PLATE
   ETAA = DAMPING COEFICIENT FOR THE FINITE PLATE
     LX & LY - DIMENSIONS OF THE FINITE PLATE
    ROA - DENSITY OF THE FINITE PLATE ACHA - THICKNESS OF THE FINITE PLATE
  RO - DENSITY OF FLUID
   XO & YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED NU - POISON'S RATIO
    EA - SHEER MODULUS OF THE FINITE PLATE
     **********************
         PARAMETER (F=1.0)
   INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)

OPEN (UNIT-25, FILE-'PR.DAT', STATUS-'OLD')

OPEN (UNIT-26, FILE-'PRA.OUT', STATUS-'NEW')
C READ INPUT DATA FROM PR.DAT
         READ (25,15) LX,LY,XO,YO,ACHA,ACHB FORMAT(4F8.3,2F8.6)
 15
         READ (25,25) ROA, ROB, RO, ETAA, ETAB, GAMMA
FORMAT(2F8.2,F8.3,2F8.7,F8.6)
READ (25,35) MU.C.EA, EB, KX1, KX1
 35
         FORMAT(F8.7,F8.3,2E8.3,2F8.2)
         READ (25,45) NU, OMEGA1, OMEGA2, INC, Z, OMEGA
FORMAT(F8.4, F8.1, F16.1, I8, F8.3, F12.3)
  COMPUTE THE VALUE OF PI
         PI-2.0*ASIN(1.0)
  COMPUT THE BENDING RIGIDITY
         DA=(EA*ACHA**3.0)/(12.0*(1.0-NU**2.0))
         DSTAR=CMPLX(DA, DA=ETAA)
         MP-ROA*ACHA*LX*LY
         WRITE(26,11) LX,LY
         FORMAT(' PARAMETERS OF FINITE PLATE',/,' DIMENSIONS OF PLATE' (LX) ',F8.3,' (LY) ',F8.3,' METERS')
11
____ &,' (LX)
         WRITE(26,21) XO, YO FORMAT(' DRIVING POINT
                                     XO ',FB.3,' YO ',FB.3,'
21
     & METERS'
         WRITE(26,31) F
         FORMAT(' DRIVING FORCE ',F8.3,' N')
WRITE(26,41)ACHA
31
41
         FORMAT( PLATE THICKNESS ',F8.6,' M')
         WRITE(26,51) ROA
FORMAT(' PLATE DENSITY ',F8.3,' KG/CU-METERS')
51
         WRITE(26,61) EA
        FORMAT(' MODULUS OF ELASTICITY ', E8.3,' N/SQ-METERS')
WRITE(26.71) DA
61
         FORMAT( ' BENDING RIGIDITY ',E12.4)
71
         WRITE(26,81) ETAA
     FORMAT(' DAMPING COEFFICIENT', F8.4)
THE FREQUENCY RANGE IS TAKEN FROM OMEGA1 TO OMEGA2 IN INCREMENTS
81
```

```
CORRESPONDING TO INC
         OMEGAB-10 IFIX (ALOG10 (OMEGAL))
C
         OMEGAT=INC:10:IFIX(ALOG10(OMEGA2))_
         DO 1000 OMEGAI-OMEGAB, OMEGAT
C
         OMEGA=2.0*PI*(10.0**(OMEGAI/(INC*10.0)))___
           DO 100 I-1,N
           DO 100 J=1,N
           BT(I,J)=0.0
           WAREAL(I,J)=0.0____
 100
           CONTINUE
         WRITE(26,12) OMEGA/(2.0*PI) _ FORMAT(/,' FREQUENCY ',F8.3,'
                                            HZ')
 12
C. THE NEXT SECTION OF THE PROGRAM UP TO LINE 58 COMPUTES THE UPPER
  AND LOWER MODES WHICH THE PLATE RESPONSE IS SUMMED OVER. NI IS THE LOWER LIMIT AND NO IS THE UPPER LIMIT
   INITIALIZE AND INCREMENT NI
       N1=-1
 18
         N1=N1+1
C _CALCULATE RESONANT OMEGA FOR EN-N1, EM-N1 MODE
         OMEGAMNO=(DA/(ROA*ACHA))**.5*(((2.0*N1+1.0)*PI/LX)**2.0
      &t((2.0*Nl+1.0)*PI/LY)**2.0)
C IF RESONANT OMEGA IS GREATER THAN OMEGA GO ON TO 28 IF NOT
C_INCREMENT_N1 AND REPEAT
         IF (OMEGAMNO.GT.OMEGA) GOTO 28
         COTO 18
   INITIALIZE AND INCREMENT N2
28
        N2=-1
38
         N2=N2+1
C__CALCULATE THE RESONANT OMEGAS FOR EN=N2, EM=0 AND EN-0, EM-N2_C MODES AND TEST IF LARGER THAN OMEGA
        OMEGAMN1=(DA/(ROA:ACHA))::.5:(((2.0:N2+1.0):PI/LX)::2.0
      4+(PI/LY) **2.0)
        OMEGAMN2=(DA/(ROA+ACHA)) ** .5 * ((PI/LX) * * 2.0_____
     4+((2.0*N2+1.0)*PI/LY)**2.0)
C_ IF LARGER THAN OMEGA GO ON TO 48 IF NOT INCREMENT N2 AND REPEAT_
         IF ((OMEGAMN1.GT.OMEGA).OR.(OMEGAMN2.GT.OMEGA)) GOTO 48
        GOTO ...38 _
48
        CONTINUE
C ADD THREE MODES TO UPPER LIMIT
        N2-N2+3
        NLL-NL
C SUBTRACT THREE MODES FROM LOWER LIMIT, ZERO IS LOWEST NI
      N1-N1-3 ....
        IF(N11.EQ.0) N1=0
        IE(N11.EQ.1) N1=0
                                         IF(N11.EQ.2) N1-0
        WRITE (6,58) N1,N2 FORMAT (215)
58
C. THE PLATE MODES ARE TAKEN FROM EM, EN = N1 TO N2.
        DO 200 EM-N1,N2
DO 200 EN-N1,N2
          DO 300 I-1,N
         DO 300 J-1,N
          BT2(I,J)=BT(I,J)
300
         CONTINUE
 OMEGAMNSO IS THE RESONANT OMEGA ** 2.0
       OMEGAMNSO-DSTAR:((((2.0°EM+1.0)°PI/LX):2.0+((2.0°EM+1.0)_
     6*PI/LY)**2.0)**2.0)/(ROA*ACHA)
        DO 400 I=1.N
DO 400 J=1.N
          X=(=LX/2.0)+(LX±(I=1))/N_
         Y=(-LY/2.0)+(LY*(J-1))/N
B(1,J)=(COS((2.0*EM+1.0)*PI*XO/LX))*(COS((2.0*EN+1.0)_
     6=PI=YO/LY))=(COS((2.0=EM+1.0)=PI=X/LX))=(COS((2.0=EN+1.0)
    &*PI*Y/LY))/(OMEGAMNSO-OMEGA**2.0)
```

```
BT(I,J)=BT(I,J)+B(I,J)
  400__
              CONTINUE
  200
           CONTINUE
           WRITE (26,301)
  301
           FORMAT (' PLATE RESPONSE')
              DO 500 1-1,N
              DO 500 J-1,N
              WA(I,J)=(4.0*F/MP)*BT(I,J)
WAREAL(I,J)=WA(I,J)
              WA2(I,J)=(4.0*E/MP)*BT2(I,J)
              WA2REAL(I,J)-WA2(I,J)
C. WA IS THE COMPLEX PLATE RESPONSE
C WAREAL IS THE REAL PART OF THE PLATE RESPONSE
C WAZ IS THE COMPLEX PLATE RESPONSE OF THE PREVIOUS MODE
C WAZREAL IS THE REAL PART OF THE PREVIOUS MODE
 500
              CONTINUE
C THE FOLLOWING DO LOOP ADDS C: THE FINAL POINT TO MAKE
C THE MATRIX SYMETRICAL
DO 550 I=1,N
              WAREAL(N+1,I)=0.0
              WAREAL(I,N+1)=0.0
              WA2REAL(N+1,1)=0.0
             WA2REAL(I,N+1)=0.0
 550
              CONTINUE
C OUTPUT PLATE RESPONSE
             DO 800 I-1,N+1
DO 800 J-1,N+1
WRITE (26,401) I-1,J-1,WA2REAL(I,J),I-1,J-1,WAREAL(I,J)
401 FORMAT (' WA2REAL(',I4,',',I4,') = ',E12.4,' WAREAL(',
£14,',',I4,') = ',E12.4)
C CALCULATE THE MAXIMUM, MINIMUM, AND INCREMENT FOR THE PLOT
             VMAX-AMAX1(ABS(WAREAL(I,J)), ABS(VMAX))
             VMIN--VMAX
             VINC-YMAX/2.0
 800
             CONTINUE
C. PLOTTER CREATES A 3-D PLOT OF THE PLATE RESPONSE
          CALL PLOTTER (VMAX, VMIN, VINC, WAREAL, WORK1, WORK2, N,
       AOMEGA.ACHA, ETAA, LX, LY)
C1000
          CONTINUE
          END
c
          SUBROUTINE PLOTTER (YMAX, YMIN, VINC, WAREAL, WORKL, WORK2, N, _____
      SOMEGA, ACHA, ETAA, LX, LY)
  PLOTTER USES THE ARL HIDE/TEMPLATE PLOTTING PACKAGE TO CREATE 3-D PLOTS OF THE PLATE RESPONSE
          REAL TYMIN, TYMIN, TYMAX, TYMAX, TXINC, TYINC
      AOMEGA, ACHA, ETAA, PI, LX, LY
          PI=2.0*ASIN(1.0)
          TXMIN--LX/2.0
          TYMIN-LY/2.0
          TXMAX-LX/2.0
          TYMAX-LY/2.0
          TXINC-LX/8.0
          TYINC-LY/8.0
          WRITE (6,501) TXMIN, TXMAX, TXINC, TYMIN, TYMAX,
      STYINC, N
          FORMAT (3F12.4,/,3F12.4,14)
CALL USLPDF
501
          CALL UPSET( 'OUTPUTFILE',7.0)
          CALL UASSCN(7.0, 'PRA.PDF\')
          CALL USTART
          CALL UDIMEN( 9.0,6.5)
CALL USET( PERCENT')
CALL UFONT( 'CROM')
CALL USET( 'LARGE')
          CALL UPRINT(61.,83., 'FREQ=\')
```

CALL UPRNT1 (OMEGA/(2.0*PI), 'REAL')	
CALL_UPRINT(7783!OMEGA=\')	
CALL UPRNT1 (OMEGA, 'REAL')	
CALL_UPRINT(61.,73.,'H = \'.)	
CALL UPRNT1 (ACHA, 'REAL')	
CALL UPRINT(77.,73.,'ETA=\')	
CALL UPRNT1 (ETAA, 'REAL')	
CALL_ARL HIDE FONT	
CALL UFONT('CROM')	
CALL USET( LARGE )	
CALL ARL HIDE SCALE(N+1,N+1,N+1,4000,N+1,VMIN,VMAX,	
6'CUTOFF', CUTOFF, Q. 5, 0.6, 1.25, 0.5, 0.5, 0.0, 45.0, 45.0,	
&'FDRAW', 'SDRAW')	
CALL_ARL HIDE(WAREAL, WORK1, WORK2)	
CALL ARL HIDE FAXIS ('VIEW', 'REAL', TXMIN, TXMAX, TXINC	,
L&'(F8.2)','X_ METERS',1,50.0,50.0)	
CALL ARL HIDE SAXIS ('VIEW', 'REAL', TYMIN, TYMAX, TYINC	•
L'(F8.2)', 'Y METERS', 1,50.0,50.0)	
CALL ARL_HIDE_VAXIS('VIEW', 'REAL', VMIN, VMAX, VINC,	
4'(E12.4)', 'AMPLITUDE',1,50.0,50.0)	
CALL UEND	
RETURN	
END	
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PROGRAM PR
C_DETERMINES. THE PLATE RESPONSE OF PLATE-B. USING IMSL
C FFT SUBROUTINE
C
C WRITTEN BY MICHAEL F. SHAW
C
INTEGER OMEGAI, OMEGAB, OMEGAT, INC, EM, EN, N, I, J,
ANRODEF, NCCOEF, LDCOEF, LDA, NLO, NUP, NL
PARAMETER (N-128)
COMPLEY DEREN OVERSLANDS CORREST IN THE STATE OF
SAT(N,N), KPF, KC, W(N,N), W1(N,N), AT1(N,N), WC(N,N),
ATEMP
REAL WFF1(4*N+15), WFF2(4*N+15), CPY(N,N)
REAL VMAX, VMIN, VINC, WREAL(N+1,N+1), WORK1(4000), WORK2(100)
REAL DA, DB, ETAB, LX, LY, ROA, ROB, ACHA, ACHB, KX(N), KY(N),
6KX1, KY1, KXM, KYN, F, RO, MP, XO, YO, IMN, Z, PRA, GAMMA, MU, NU, C, E,
6HKX, HKY, PI, K, KP, OMEGA, OMEGA1, OMEGA2, OMEGAMNO,
LOMEGAMN1, OMEGAMN2, W1REAL(N+1,N+1), TEMP2, TEMP1
INTRINSIC CMPLX
EXTERNAL F2T2B, FFTCI
C THE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS
COMMON /WORKSP/ RWKSP
REAL RWKSP(8884)
C 3355555555555555555555555555555555555
C VARIABLE LIST
C
C DA - BENDING RIGIDITY OF THE FINITE PLATE
C DB -BENDING RIGIDITY OF THE INFINITE PLATE
C ETAA - DAMPING COEFICIENT FOR THE FINITE PLATE .
C _ ETAB - DAMPING COEFICIENT FOR THE INFINITE PLATE
C LX & LY - DIMENSIONS OF THE FINITE PLATE
CROA - DENSITY OF THE FINITE PLATE
C ROB - DENSITY OF THE INFINITE PLATE
CACHA THICKNESS OF THE FINITE PLATE
C ACHB - THICKNESS OF THE INFINITE PLATE
CRO - DENSITY OF FLUID
C XO & YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED
CZ - DISTANCE BETWEEN THE PLATES
C PRA - PRANDEL NUMBER FOR FLUID
C GAMMA - SPECIFIC HEAT RATIO FOR FLUID
C MU - VISCOSITY OF FLUID
C_NU - POISON'S RATIO
C C - SPEED OF SOUND IN FLUID
C_EA - SHEER MODULUS OF THE FINITE PLATE
C EB - SHEER MODULUS OF THE INFINITE PLATE
C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR
C KY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR
720022000000000000000000000000000000000
PARAMETER (F-1.0)
C INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)
OPEN (UNIT-25, FILE-'PR.DAT', STATUS-'OLD')
OPEN (UNIT-26, FILE-'PR.OUT', STATUS-'NEW')
C ANOTHER LINE SO N CAN BE LARGER THAN 64
CALLIWKIN(8884) C READ INPUT DATA FROM PR.DAT
READ (25,15) LX.LY.XO.YO.ACHA.ACHB
15 FORMAT(4F8.3,2F8.6)
READ. (25,25) ROA, ROB, RO, ETAA, ETAB, GAMMA, PRA
25 FORMAT(2F8.3, 2F8.3, 2F8.7, 2F8.6)
READ. (25, 35) MU,C,EA,EB,KX1,KY1
35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)
READ_(25,45) NU,OMEGA1,OMEGA2,INC,Z,OMEGA
45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)
C _COMPUTE THE VALUE OF PI
PI-2.0*ASIN(1.0)
C COMPUTE THE BENDING RIGIDITIES
المعربية الم

```
DA-(EA+ACIA++3.0)/(12.0+(1.0-NU++2.0))
       __ DB=(EB*ACHB**3.0)/(12.0*(1.0-NU**2.0))
         DSTAR-CMPLX(DA, DA*(ETAA))
        _MP=ROA*ACHA*LX*LY
  THE SAMPLE SPACING IN WAVENUMBER SPACE IS HKX AND HKY
____ HKX=KX1/N ___
         HKY-KY1/N
   PARAMETERS FOR FFT2B INVERSE FOURIER TRANSFORM SUBROUTINE
        NRCOEF-N
       _ NCCOEF-N . __
         LDCOEF-N
         LDA-N
         WRITE(26,11) LX,LY
        FORMAT(' PARAMETERS OF FINITE PLATE',/,' DIMENSIONS OF PLATE' (LX) ',F8.3,' (LY) ',F8.3,' METERS')
 11
        WRITE(26,21) XO, YO
 21
         FORMAT(' DRIVING POINT XO ',F8.3,' YO ',F8.3,'
     & METERS')
        WRITE(26,31) F
        FORMAT(! DRIVING FORCE ',F8.3,' N')
WRITE(26,41)ACHA
       FORMAT(! PLATE THICKNESS ',F8.6,' M')
         WRITE(26,51) ROA
 51 FORMAT(' PLATE DENSITY ',F8.3,' KG/CU-METERS')
        WRITE(26,61) EA
       FORMAT(' MODULUS OF ELASTICITY ', E8.3,' N/SQ-METERS')
       WRITE(26,71) DA FORMAT(! BENDING RIGIDITY ',E12.4)
        WRITE(26,81) ETAA
 81 FORMAT(' DAMPING COEFFICIENT', F8.4)
WRITE(26,91)
91 FORMAT(/,' PARAMETERS OF INFINITE PLATE',/)
WRITE(26,101) ACHB
 101 FORMAT(' PLATE THICKNESS ',F8.6,' M')
 WRITE(26,111) ROB
111 FORMAT(' PLATE DENSITY ',F8.3,' KG/CU-METERS')
         WRITE(26,121) EB
121 FORMAT(' MODULUS OF ELASTICITY ',E8.3,' N/SQ-METERS')
WRITE(26,131) DB
        FORMAT( ! BENDING RIGIDITY ',E12.4)
 131.
        WRITE(26,141) ETAB
 141 __ FORMAT(! DAMPING COEFICIENT', F8.4)
        WRITE(26,151) RO
     FORMAT(/,' PARAMETERS FOR FLUID',/,' DENSITY ',F8.3, L' KG/CU-METER')
       WRITE(26,161) MU
        FORMAT(' VISCOSITY ',F8.7,' KG/M-S')
 161
        WRITE(26,181) C FORMAT(' SPEED OF SOUND ',F8.3,' M/S')
 181
        WRITE(26,191) PRA
        FORMAT(' PRANDTL NUMBER ',F8.3)
WRITE(26,201) GAMMA
 191
        FORMAT( ' SPECIFIC HEAT RATIO ', F8.3)
 201
        WRITE(26,211) Z
        FORMAT( DISTANCE RETWEEN PLATES ',F8.3,' M')
 211
C INITIALIZATION ROUTINES FOR THE FFT
        CALL FFTCI(N, WFF1)
        CALL FFICI(N, WFF2).
     THE FREQUENCY RANGE IS TAKEN FROM OMEGAB TO OMEGAT IN INCREMENTS
   CORRESPONDING TO INC
C
        OMEGAB-10*IFIX(ALOG10(OMEGAL))
C
        OMEGA2-INC+10+IFIX(ALOG10(OMEGA2))
        DO 1000 OMEGAI-OMEGAB, OMEGAT
C..
        OMEGA-2.0*PI*(10.0**(OMEGA)/(INC*10.0)))
          DO 100 1-1,N
```

```
DO 100 J-1,N
           AT(1,J)=0.0 ..__.
  100
           CONTINUE
 C_ K IS THE WAVENUMBER IN THE FLUID
         K-OMEGA/C
 C . KC. IS THE COMPLEX WAVENUMBER
         KC=(K)*CMPLX(1.0,(OMEGA*MU*((4.0/3.0)+((GAMMA-1.0)/PRA)
      6)/(2.0*RO*C**2.0)))_
 C KP IS THE PLATE WAVENUMBER
        KP-(ROB*ACHB*OMEGA**2.0/DB)**.25
 C KPF IS THE COMPLEX WAVENUMBER ** 4.0
         KPF=(ROB*ACHB*OMEGA**2.0/DB)*CMPLX(1.0,ETAB)
         WRITE(26,12) OMEGA/(2.0*PI)
         FORMAT(/,' FREQUENCY ',F8.3,' WRITE(26,22) KC
                                           HZ'1
         FORMAT(' COMPLEX WAVENUMBER ',F8.3,' + i ',F8.3,' 1/M')
         WRITE(26,32) (KPF)**.25
        FORMAT(! COMPLEX_PLATE WAVENUMBER ',E12.4,' + 1 '
E12.4,' 1/M')
 .32.__ .
      4,E12.4,
 C THE NEXT SECTION (UNTIL LINE 58) COMPUTES THE UPPER AND LOWER
   MODES WHICH THE EQUATION IS SUMMED OVER. NUP IS THE UPPER LIMIT
   AND NLO IS THE LOWER LIMIT.
  INITIALIZE AND INCREMENT NLO
        _ NIO---1
 18
         NLO-NLO+1
 C__CALCULATE_RESONANT OMEGA FOR THE EN-NLO, EM-NLO MODE
        OMEGAMNO-(DA/(ROA*ACHA))**.5*(((2.0*NLO+1.0)*PI/LX)**2.0
C IF THIS RESONANT OMEGA IS LARGER THAN OMEGA GO ON TO 28 IF NOT
   INCREMENT NLO AND REPEAT.
         IF (OMEGAMNO.GT.OMEGA) GOTO 28
        0010 .18
   INITIALIZE AND INCREMENT NUP
        NUP-1
 38
        NUP-NUP+1
C_ CALCULATE THE RESONANT OMEGAS FOR EN-NUP, EM-0 AND EN-0, EM-NUP_C MODES AND TEST IF LARGER THAN OMEGA
        OMEGAMN1-(DA/(ROA*ACHA))**.5*(((2.0*NUP+1.0)*PI/LX)**2.0__
     6+(PI/LY)**2.0)
        OMEGAMN2-(DA/(ROA+ACHA))**.5*((PI/LX)**2.0 ___
     4+((2.0*NUP+1.0)*PI/LY)**2.0)
C.__IF_LARGER THAN OMEGAGO ON TO 48, IF NOT INCREMENT NUP AND REPEAT ____
        IF ((OMEGAMN1.GT.OMEGA).OR. (OMEGAMN2.GT.OMEGA)) GOTO 48
        COTO 38
 48
        CONTINUE
C_ ADD THREE MODES ON TO UPPER LIMIT
        NUP-NUP+3
        N11-NIO
C SUBTRACT THREE MODES FROM LOWER LIMIT, ZERO IS THE LOWEST
        IF(N11.EQ.0) NIO-0
        IF(N11.EQ.1) NLO-0
        IF(N11.EQ.2) NLO-0
        WRITE (6,58) NLO, NUP .
 58 ----
        FORMAT (215)
C THE PLATE MODES ARE TAKEN FROM EM AND EN - NLO TO NUP.
        DO 200 EM-NLO, NUP
        DO. 200 EN-NLO, NUP.
          DO 300 I-1,N
          DO J-1,N
C AT1 IS THE PREVIOUS MODE SUM
AT1(I,J)-AT(I,J)
300
          CONTINUE
C OMEGAMINSO IS THE RESONANT OMEGA+2
        OMEGAMNSO-DSTAR*((((2.0°EM+1.0)*PJ/1.X)**2.0+((2.0°EN+1.0)
     4-PI/LY) -- 2.0) -- 2.0)/(ROA-ACIA)
```

```
KXH-((2.0°EM+1.0)°PI/J.X)
          KYN=((2.0*EN+1.0)*P1/LY)
  COEFICIENT CALCULATES THE INPUT ARRAY (COEF) TO THE FFT
         CALL COEFICIENT (N,HKX,HKY,KX1,KY1,PI,KXM,KYN,
  &K,KC,KPF,Z,KX,KY,LX,LY,EM,EN,COEF)
_F2T2B IS AN IMSL SUBROUTINE WHICH CALCULATES THE 2-D FFT OF
   A SET OF FOURIER COEFFICIENTS.
   COEF(I,J) IS THE INPUT ARRAY
A(I,J) IS THE OUTPUT ARRAY
         CALL F2T2B(NRCOEF, NCCOEF, A, LDA, COEF, LDCOEF, WFF1, WFF2,
      EWC, CPY)
         DO 400 I=1,N
DO 400 J=1,N
            \Lambda 1(I,J)=(1/(2.0*PI)**2.0)*HKX*HKY*((-1)**I)*((-1)**J)
      6*A(I,J)*(COS((2.0*EM+1.0)*PI*XO/LX)*
    _ 6COS((2.0*EN+1.0)*PI*YO/LY)/(OMEGAMNSQ-OMEGA**2.0))
            AT(I,J)=AT(I,J)+Al(I,J)
 400
            CONTINUE
 200
         CONTINUE
         WRITE (26,301) FORMAT (' PLATE RESPONSE')

DO 500 I=1,N
 301
           DO 500 J=1,N 8
W(I,J)=((-4.0)*F*RO*OMEGA**2.0*AT(I,J))/(MP*DB)
           W1(I,J)=((-4_0)*F*RO*OMEGA**2.0*AT1(I,J))/(MP*DB)
WREAL(I,J)=W(I,J) 8
            WIREAL(I,J)=WI(I,J)
  WREAL(I,J) IS THE REAL PART OF THE PLATE RESPONSE W(I,J) IS THE COMPLEX PLATE RESPONSE
  W(I,J)
               IS THE COMPLEX PLATE RESPONSE OF THE PREVIOUS MODE
  _.W1(I,J).
 500
           CONTINUE
   THE FOLLOWING TWO DO-LOOPS CONVERT THE OUTPUT PLATE RESPONSE
   IN THE X-Y PLANE SO THAT THE RESPONSE SHOWS THE CENTER OF THE
   PLATE IN THE CENTER OF THE ARRAY
                      2 |
                           3
C
                       2
            DO 600 I-1.N
            DO 600 J-1,N/2
             TEMP1-WREAL(I,J)
             TEMP2-W1REAL(I,J)
             WREAL(I,J)=WREAL(I,N/2+J)
            WIREAL(I,J)=WIREAL(I,N/2+J)
             WREAL(I,N/2+J)=TEMP1
            WIREAL(I,N/2+J)=TEMP2
 600
            CONTINUE
            DO 700 J=1,N
            DO 700 I=1.N/2
            TEMP1-WREAL(I,J)
            TEMP2-WIREAL(I,J)
             WREAL(I,J)-WREAL(N/2:I,J)
            WIREAL(I,J)-WIREAL(N/2+I,J)
WREAL(N/2+I,J)-TEMP1
            WIREAL(N/2+1,J)=TEMP2
            CONTINUE
 700
C_THE FOLLOWING DO LOOP ADDS ON THE FINAL POINT TO MAKE
  THE MATRIX SYMETRICAL
            DO 550 1-1,N+1
            WREAL(I,N+1)=WREAL(I,1)
            WREAL(N+1,I)-WREAL(1,I)
 550
            CONTINUE
  OUTPUT PLATE RESPONSE
```

```
DO 800 I-1,N
            DO 800 J-1,N.
            WRITE (26,401) I-1,J-1,WIREAL(I,J),I-1,J-1,WREAL(I,J)

FORMAT ('.W1(',I4,',',I4,') = ',E12.4,2X,' W(',',I4,') = ',E12.4,2X,' W(',',I4,') = ',E12.4)
C_CALCULATE THE MAXIMUM, MINIMUM, AND INCREMENT FOR THE PLOT
            VMAX-AMAX1(ABS(WREAL(I,J)),ABS(VMAX))
            YMIN-VMAX
            VINC-VMAX/2.0
           CONTINUE
C PLOTTER CREATES A 3-D GRAPH OF THE PLATE RESPONSE
        CALL PLOTTER (VMAX, VMIN, VINC, WREAL, WORK1, WORK2, N, KX1, KY1,
      &Z,OMEGA, ACHB, ETAB, KP, K)
C. 1000 CONTINUE
C .....
          SUBROUTINE COEFICIENT (N,HKX,HKY,KX1,KY1,PI,KXM,KYN,
      &K,KC,KPF,Z,KX,KY,LX,LY,EM,EN,COEF)
  COEFICIENT CALCULATES THE FOURIER COEFICIENTS FOR USE IN THE
C. FFT2B SUBROUTINE
         REAL KX(N), KY(N), IMN, HKX, HKY, PI, KX1, KY1,
    AKXM, KYN, Z, LX, LY, K_
         INTEGER EM, EN, N
         COMPLEX TEMP, KC, KPF, COEF(N, N)
         DO 10 I-1.N
DO 10 J-1.N
C THE FFT USES THE INTERVAL FROM -KX1/2 0 TO KX1/2.0
         _XX(I)=((I-1)*HKX)=(KX1/2.0)__________
         KY(J) = ((J-1)*HKY) - (KY1/2.0)
C. THE FOLLOWING IF STATEMENTS DETERMINE THE VALUE FOR IMN
     IF ((KXM**2.0 .EQ. KX(1)**2.0).AND.
6(KYM**2.0 .EQ. KY(J)**2.0))
6IMN-LX*LY/4.0
     ___IF_((KXM**2.0 .EQ. KX(I)**2.0).AND.
6(KYN**2.0 .NE. KY(J)**2.0))
     &IMN-LX*KYN*COS(KY(J)*LY/2.0)*(-1.0)**EN/
&(KYN**2.0-KY(J)**2.0)
         IF ((RXM**2.0 .NE. KX(I)**2.0).AND.
     4(KYN**2.0 .EQ. KY(J)**2.0))
     61MN-LY#RXM*COS(KX(I)*LX/2.0)*(-1.0)**EM/
     6(KXM**2.0-KX(I)**2.0)

IF_((KXM**2.0.NE.KX(I)**2.0).AND.

6(KYN**2.0.NE.KY(J)**2.0))
     $IMN=4.0*KXM*KYN*COS(KX(I)*LX/2.0)*
    4COS(KY(J)*LY/2.0)*(-1.0)**EM*(-1.0)**EN/
-4((KXM**2.0-KX(I)**2.0)*(KYM**2.0-
     4KY(J)**2.0))
C THE FOLLOWING IF-STATEMENT TESTS IF THE EXPRESSION IS C NEGATIVE FOR USE IN THE COMPLEX EXPRESSION FOR COEF(I,J)
       __IF (K**2.0-KX(I)**2.0-KY(J)**2.0) 55, 65, 65
    TEMP=CMPLX(((ABS(K**2.0-KX(I)**2.0-

&KY(J)**2.0))**.5)*(-Z),0.0)
         GOTO 75
         TEMP-CMPLX(0.0,((K**2.0-KX(I)**2.0-
 65
     &KY(J)**2.0)**0.5)*Z)
        CONTINUE
  CALCULATE COEF

COEF(I,J)=CEXP(TEMP)*IMN/

6((KC**2.0-KX(I)**2.0-KY(J)**2.0)**.5*
     4((KX(I) **2.0+KY(J) **2.0) **2.0-KPF))
10
        CONTINUE
        RETURN
        SUBROUTINE PLOTTER (VHAX, VHIN, VINC, WREAL, WORK1, WORK2, N,
     AKX1, KY1, Z, OMEGA, ACIB, ETAB, KP, K)
```

C PLOTTER USES THE ARL HIDE/TEMPLATE PLOTTING PACKAGE T	O CREATE
C_3-D PLOTS OF THE PLATE RESPONSE REAL KX1,KY1,TXMIN,TYMIN,TXMAX,TYMAX,TXINC,TYINC	, - · ————
LOMEGA, ACIB, ETAB, KP, K, Z, PI	
PI=2.0*ASIN(1.0)	
TXMIN=-N*PI/KX1 TYMIN=-N*PI/KY1	- · · · · · · · · · · · · · · · · · · ·
TXMAX=N*PI/KX1	
TYMAX-N*PI/KYl	
TXINC-N*PI/(4.0*KX1) TYINC-N*PI/(4.0*KY1)	•••
WRITE (6,501) KX1, TXMIN, TXMAX, TXINC, KY1, TYMIN, TY	MAY.
&TYINC,N	
501 FORMAT (4F12.4,/,4F12.4,14) CALL USLPDF	
CALL UPSET( 'OUTPUTFILE', 7.0)	
CALL UASSGN(7.0, 'PR.PDF\')	
CALL USTART	
CALL UDIMEN( 9.0,6.5) CALL USET('PERCENT')	
CALL UFONT('CROM')	
CALL USET('LARGE')	
CALL UPRINT(61.,93.,'KX1= \')CALL UPRNT1(KX1,'REAL')	
CALL UPRINT(77.,93.,'KY1- \')	·
CALL UPRNT1(KY1, 'REAL')	
CALL UPRINT(61.,88.,'Z - \')CALL UPRNT1(Z,'REAL')	
CALL UPRINT(77.,88.,'H - \')	-
CALL UPRNT1 (ACHB, 'REAL')	**************************************
CALL UPRINT(61.,83.,'FREQ=\') CALL UPRNT1(OMEGA/(2.0*PI),'REAL')	
CALL UPRINT(77.,83.,'OMEGA=\')	The state of the s
CALL UPRNT1(OMEGA, 'REAL')	
CALL UPRINT(61.,78.,'K - \') CALL UPRNT1(K,'REAL')	
CALL UPRINT(77.,78.,'KP = \')	4
CALL_UPRNT1(KP, 'REAL')	· · · · · · · · · · · · · · · · · · ·
CALL UPRINT(77.,73.,'ETA= \')CALL UPRNT1(ETAB,'REAL')	
CALL ARL HIDE FONT	·
CALL UFONT('CROM')	· · · · · · · · · · · · · · · · · · ·
CALL USET('LARGE')CALL_ARL_HIDE_SCALE(N+1,N+1,N+1,4000,N+1,VMIN,VMA	•
6'CUTOFF', CUTOFF, 0.5, 0.6, 1.25, 0.5, 0.5, 0.0, 45.0, 45.0,	
4'FDRAW','SDRAW')	
CALL ARL_HIDE(WREAL, WORK1, WORK2)CALL_ARL_HIDE_FAXIS('VIEW', 'REAL', TXMIN, TXMAX, TXI	100
&'(F8.2)','X METERS',1,50.0,50.0)	
CALL ARL HIDE SAXIS('VIEW', 'REAL', TYMIN.TYMAX.TYI	NC,
6'(F8.2)','Y METERS',1,50.0,50.0)  CALL ARL_HIDE_VAXIS('VIEW','REAL',VMIN,VMAX,VINC,	
6'(E12.4)', "AMPLITUDE', 1, 50.0, 50.0)	.=
CALL UEND	
RETURN END:	ł
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	<u>J</u>

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PROGRAM PRTL5K
C. DETERMINES THE TRANSMISSION LOSS BETWEEN PLATE-A AND PLATE-B .
   USING RMS VIBRATION LEVELS OF EACH PLATE
   WRITTEN BY MICHAEL F. SHAW
 INTEGER OMEGAI, OMEGAB, OMEGAT, INC, EM, EN, I, J,

LNRCOEF, NCCOEF, LDCOEF, LDA, N, NLO, NUP, N11
         PARAMETER (N-128)
         COMPLEX DSTAR, OMEGAMNSQ, COEF(N, N), A(N, N), B1(N, N),
      &BT(N,N), KPF, KC, WA(N,N), WB(N,N), AT(N,N), B(N,N),
      AWC(N,N)
         REAL WFF1(4*N+15), WFF2(4*N+15), CPY(N,N)
         REAL WBREAL(N,N), WAREAL(N,N), WORK1(4000), WORK2(100),
      AMPA, AMPB, TAU, TL(200), COUNT, OMEGA1, OMEGA2, X1(200), OMEGART
         REAL DA.DB.ETAA.ETAB.LX.LY.ROA.ROB.ACHA.ACHB.KX(N).KY(N).
      &KX1, KY1, KXM, KYN, F, RO, MP, XO, YO, IMN, Z, PRA, GAMMA, MU, NU, C, E,
 LIKY, HKY, PI, K, KP, OMEGA, OMEGAMNO, OMEGAMN1, OMEGAMN2
         INTRINSIC CMPLX
         EXTERNAL F2T2B, FFTCI
  THE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS
       COMMON /WORKSP/ RWKSP
         REAL RWKSP(8884)
  VARIABLE LIST
    DA - BENDING RIGIDITY OF THE FINITE PLATE
  DB -BENDING RIGIDITY OF THE INFINITE PLATE
    ETAA - DAMPING COEFICIENT FOR THE FINITE PLATE
   ETAB - DAMPING COEFICIENT FOR THE INFINITE PLATE
    LX & LY - DIMENSIONS OF THE FINITE PLATE
   ROA - DENSITY OF THE FINITE PLATE
ROB - DENSITY OF THE INFINITE PLATE
  ACHA - THICKNESS OF THE FINITE PLATE
ACHB - THICKNESS OF THE INFINITE PLATE
   RO - DENSITY OF FLUID
    XO & YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED
    Z - DISTANCE BETWEEN THE PLATES
PRA - PRANDEL NUMBER FOR FLUID
  _ GAMMA - SPECIFIC HEAT RATIO FOR FLUID
    MU - VISCOSITY OF FLUID
  _ NU - POISON'S RATIO
    C - SPEED OF SOUND IN FLUID
    EA - SHEER MODULUS OF THE FINITE PLATE
EB - SHEER MODULUS OF THE INFINITE PLATE
    KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR
c
    KY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR
         PARAMETER (F=1.0)
     INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE & UNIT FORCE (1)
        OPEN (UNIT-25, FILE-'PR5K.DAT', STATUS-'OLD')
OPEN (UNIT-26, FILE-'PRTL5K.OUT', STATUS-'NEW')
C ANOTHER LINE SO N CAN BE LARGER THAN 64
        CALL IWKIN(8884)
C READ INPUT DATA FROM PR. DAT
        READ (25,15) LY,LY,XO,YO,ACHA,ACHL
FORMAT(4F8.3,2F8.6)
15
        READ (25,25) ROA, ROB, RO, ETAA, ETAB, GAMMA, PRA
        FORMAT(2F8.2,F8.3,2F8.7,2F8.6)
 25
        READ (25.35) MU,C,EA,EB,KX1,KY1
FORMAT(F8.7,F8.3,2E8.3,2F8.2)
        READ (25,45) NU, OMEGAL, OMEGA2, INC. Z. OMEGA
        FORMAT(F8.4,F8.1,F16.1,I8,F8.3,F12.3)
C COMPUTE THE VALUE OF PI
        PI-2.0*ASIN(1.0)
C COMPUTE THE BENDING RIGIDITIES
```

DA=(EA*ACHA**3.0)/(12.0*(1.0-NU**2.0))	
DB=(EB*ACIB**3.0)/(12.0*(1.0-NU**2.0))	
DSTAR=CMPLX(DA, DA*ETAA)	·····
MP=ROA=ACHA=LX=LY	
WRITE(26,11) LX,LY	
11 FORMAT(' PARAMETERS OF FINITE PLATE',/,! DIMENSIONS	OP PLATE!
4,' (LX) ',F8.3,' (LY) ',F8.3,' METERS')	
WRITE(26,21) XO,YO 21 FORMAT(' DRIVING POINT XO ',F8.3,' YO ',F8.3,'	
·	
MRITE(26,31) F	~
31 FORMAT(' DRIVING FORCE ',F8.3,' N')	
WRITE(26,41)ACHA	
41 FORMAT(! PLATE THICKNESS ',F8.6.! M')	
WRITE(26,51) ROA  51 FORMAT(' PLATE DENSITY ',F8.3,' KG/CU-METERS')	
51 FORMAT(' PLATE DENSITY ',F8.3,' KG/CU-METERS')	-
WRITE(26,61) EA	• -
61 FORMAT( MODULUS OF ELASTICITY , E8.1, N/SO-METERS	-)
WRITE(26,71) DA 71 FORMAT(' BENDING RIGIDITY ',E12.4)	
WRITE(26.81) ETAA	
B1 FORMAT(! DAMPING COEFFICIENT!, FB.4)	
WRITE(26,91)	
WRITE(26,91) 91 FORMAT(/, PARAMETERS OF INFINITE PLATE!,/)	
WRITE(26,101) ACHB	
WRITE(26,111) ROB	
111 FORMAT( 'PLATE DENSITY ',F8.3,' KG/CU-METERS')	
WRITE(26,121) EB 121 FORMAT('MODULUS OF ELASTICITY '.E8.3,' N/SQ-METERS	
WRITE(26,131) DB	·
131 FORMAT( 'BENDING RIGIDITY ',E12.4)	
WRITE(26,141) ETAB	
WRITE(26,151) RO	
151 FORMAT(/, ' PARAMETERS FOR FLUID',/, ' DENSITY ',F8.3,	
&' KG/CU-METER')	i
WRITE(26,161) MU	<del></del>
STOTE 01 101 1 0	
181 FORMAT/' SPEED OF SOUND '.FR.3.' M/S')	
191 FORMAT('PRANDTL NUMBER ', F8.3)	
WRITE(26.201) GAMMA	
201 FORMAT(' SPECIFIC HEAT RATIO ',F8.3)	
WRITE(26,211) Z 211 FORMAT(' DISTANCE BETWEEN PLATES ',F8.3,' M')	
C THE FREQUENCY RANGE IS TAKEN FROM 1258 TO 5000 H2	
DO 1000 OMEGAI=31,37	
OMEGA=2.0*PI*(10.0**(OMEGAI/10.0))	
C_KXI AND KYI ARE	
C THE LIMITS OF THE FFT. THE FFT IS TAKEN FROM -KX1/2.0 TO	
CKX1/2.0 AND FROM =KY1/2.0 TO KY1/2.0	
KX1-402.2 KY1-402.2	}
C THE SAMPLE SPACING IS HKX AND HKY	
HXI-KXI/N	i
HKY-KY1/N	
C_ PARAMETERS FOR FFT2B INVERSE FOURIER TRANSFORM SUBHOUTINE	
NRCOEF-N	
NCODEF-N	
LDCOEF-N LDA-N	ł
C INITIALIZATION ROUTINES FOR THE FFT	
CALL FFTCI(N,WFF1)	

```
CALL FFTCI(N, WFF2)
 C. K IS THE WAVENUMBER IN THE FLUID
         K-OMEGA/C
 C .KC.IS THE COMPLEX WAVENUMBER
         KC=(K)*CMPLX(1.0, (OMEGA*MU*((4.0/3.0)+((GAMMA-1.0)/PRA)
      4)/(2.0*RO*C**2.0)))
 C KP IS THE PLATE WAVENUMBER
         KP=(ROB*ACHB*OMEGA**2.0/DB)**.25
   KPF IS THE COMPLEX PLATE WAVENUMBER ** 4.0
       KPF=(ROB=ACHB=OMEGA==2.0/DB)=CMPLX(1.0,ETAB)
         DO 100 I=1,N
         DO 100 J-1,N
         BT(I,J)=0.0
         AT(I,J)-0.0
 100
         CONTINUE
   OMEGAMNSUB CALCULATES THE UPPER AND LOWER MODES NUP, NLO
         CALL OMEGAMNSUB(NLO, NUP, OMEGA, ROA, ACHA, DA, LX, LY)
    THE PLATE MODES ARE TAKEN FROM EM AND EN - NLO TO NUP
         DO 200 EM-NLO, NUP
         DO 200 EN-NLO, NUP
 C OMEGANMSQ IS THE RESONANT OMEGA**2
         OMEGAMNSQ-DSTAR*((((2.0*EM+1.0)*PI/LX)**2.0+((2.0*EN+1.0)
      6*PI/LY)**2.0)**2.0)/(ROA*ACHA)
         KXM-((2.0=EM+1.0)=PI/LX)
         KYN=((2.0*EN+1.0)*PI/LY)
 C COEFICIENT CALCULATES THE INPUT ARRAY TO THE FFT (COEF)
         CALL COEFICIENT (N, HKX, HKY, KX1, KY1, PI, KXM, KYN,
      &K, KC, KPF, Z, KX, KY, LX, LY, EM, EN, COEF)
C FFT2B IS AN IMSL SUBROUTINE WHICH CALCULATES THE 2-D FFT OF C A SET OF FOURIER COEFFICIENTS
  COEF(I,J) IS THE INPUT ARRAY
         IS THE OUTPUT ARRAY
CALL F2T2B (NRCOEF, NCCOEF, A, LDA, COEF, LDCOEF, WFF1, WFF2,
  A(I,J)
  ..... &WC,CPY)
           DO 400 I-1,N
           DO 400 J=1,N
           B(I,J)=A(I,J)
      Bl(I,J)=(1.0/(2.0*PI)**2.0)*HKX*HKY*((-1)**I)*((-1)**J).
6*B(I,J)*(COS((2.0*EM+1.0)*PI*XO/LX)*COS((2.0*EM+1.0)
     L*PI*YO/LY)/(OMEGAMNSQ-OMEGA**2.0))
           BT(I,J)=BT(I,J)+Bl(I,J)
 400
           CONTINUE
 200
         CONTINUE
           DO 500 I=1,N
           DO 500 J-1,N 8
           C WBREAL(I,J) IS THE REAL PART OF THE PLATE-B RESPONSE
C WB(I,J) IS THE COMPLEX PLATE-B RESPONSE
   WB(I,J)
           CONTINUE
   THE FOLLOWING TWO DO-LOOPS CONVERT THE OUTPUT PLATE RESPONSE
   IN THE X-Y PLANE SO THAT THE RESPONSE SHOWS THE CENTER OF THE PLATE IN THE CENTER OF THE ARRAY
unnan
                  3 4 | 3
           DO 600 I-1,N
           DO 600 J-1,N/2
            TEMP-WBREAL(I,J)
            WBREAL(I,J)-WBREAL(I,N/2+J)
            WBREAL(I,N/2+J)-TEMP
 600
           CONTINUE
```

```
DO 700 J-1,N
                         DO_700 I=1,N/2
                          TEMP-WBREAL(I,J)
                          WBREAL(I,J)=WBREAL(N/2+I,J)_
                          WBREAL(N/2+I,J)-TEMP
   700
                         CONTINUE
                   AMPB-0.0
                  COUNT-0.0
     CALCULATE THE AMPLITUDE OF VIBRATION IN THE PORTION OF THE PLATE
       SHADOWED BY THE UPPER PLATE
                       DO 800 I=(N/2)-(KX1*LX/(4.0*PI)),(N/2)+(KX1*LX/(4.0*PI))
                       DO_800_J=(N/2)-(KY1*LY/(4.0*PI)),(N/2)+(KY1*LY/(4.0*PI))_
                   AMPB-AMPB+WBREAL(I,J) **2.0
                   COUNT=COUNT+1.0
   800
                       CONTINUE
 C__AMPB IS THE SUM OF THE SOURCES OF THE PLATE RESPONSE OF THE AREA
     OF PLATE B SHADOWED BY PLATE A
     _AMPTB IS AMPB DIVIDED BY THE NUMBER OF POINTS_
                   AMPTB-AMPB/COUNT
       CALCULATE THE VIBRATION RESPONSE OF PLATE A
                  DO 250 EM-NLO, NUP
                  DO 250 EN-NIO NUP
                  OMEGAMNSQ-DSTAR*((((2.0*EM+1.0)*PI/LX)**2.0+((2.0*EN+1.0)
            E=PI/LY)==2.0)==2.0)/(ROA=ACHA)
                      DO 450 I-1,N
DO 450 J-1,N
                       X=(-LX/2.0)+(LX*(I-1))/N
                      Y=(-LY/2.0)+(LY*(J-1))/N
                       A(I,J)=(\cos((2.0*EM+1.0)*PI*XO/LX))*(\cos((2.0*EN+1.0))*(\cos((2.0*EN+1.0))*(\cos((2.0*EN+1.0))*(\cos((2.0*EN+1.0))*(\cos((2.0*EN+1.0))*(\cos((2.0*EN+1.0))*(\cos((2.0*EN+1.0))*(\cos((2.0*EN+1.0))*(\cos((2.0*EN+1.0))*(\cos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0))*(oos((2.0*EN+1.0
            4 PI YO/LY)) (COS((2.0 PM+1.0) PI Y/LX)) (COS((2.0 EN+1.0)
           &*PI*Y/LY))/(OMEGAMNSO-OMEGA**2.0)
                      AT(I,J)=AT(I,J)+A(I,J) ....
  450
                      CONTINUE
  250
                  CONTINUE
                  AMPA-0.0
                  COUNT-0.0
                      DO 550 I=1,N
DO 550 J=1,N
                      WA(I,J)=(4.0*PMP)*AT(I,J)
WAREAL(I,J)=WA(I,J)
C WAREAL IS THE REAL PART OF THE PLATE RESPONSE OF PLATE A
C WA IS THE COMPLEX PLATE RESPONSE OF PLATE A
                  AMPA-AMPA+WAREAL(I,J) **2.0
                 COUNT-COUNTY1_0
  550
                      CONTINUE
                 AMPTA=AMPA/COUNT
    AMPA IS THE SUM OF THE SQUARES OF THE PLATE RESPONSE OVER PLATE A
C AMPTA IS AMPA DIVIDED BY THE NUMBER OF POINTS
     WRITE (26,321) AMPTA, AMPTB
OUTPUT AMPTA AND AMPTB
321 FORMAT (25X, AMPTA- ',E12.6, AMPTB- ',E12.6)
C. THE FOLLOWING IF STATEMENT TESTS IF AMPTB IS TOO SMALL
                 IF(AMPTB.LE.(10.0**(-90.0)))GO TO 650
                 TAU-AMPTB/AMPTA
C CALCULATE TRANSMISSION LOSS
                 TL(OMEGAI)=10.0 (ALOG10(1.0/TAU))______
                 X1(OMEGAI)=FLOAT(OMEGAI)
C_OUTPUT TRANSMISSION LOSS
                 WRITE(26,311)OMEGA/(2.0°PI),TL(OMEGAI)
 311
                 FORMAT(F12.2,10x,F6.2)
                 COTO 1000
                TL(OMEGAI)-101.0
 650
                WRITE(26,311)OMEGA/(2.0*PI),TL(OMEGAI)
 1000__CONTINUE_
                 WRITE(26,411)
                FORMAT(//)
 411
```

```
END
           SUBROUTINE COEFICIENT (N, HKX, HKY, KX1, KY1, PI, KXM, KYN,
       &K, KC, KPF, Z, KY, KY, LY, LY, EM, EN, COEF)
   COEFICIENT CALCULATES THE FOURIER COEFICIENTS FOR USE IN THE
 C_ FFT2B SUBROUTINE
          REAL KX(N), KY(N), IMN, HKX, HKY, PI, KX1, KY1,
       &KXM.KYN.Z.LX,LY,K
          INTEGER EM, EN, N
          COMPLEX TEMP. KC, KPF, COEF(N, N)
          DO 10 I-1,N
          DO 10 J=1,N
   THE FFT USES THE INTERVAL FROM -KX1/2.0 TO KX1/2.0
 C_AND -KY1/2.0 TO KY1/2.0
          KX(I) = ((I-1)*HKX) - (KX1/2.0)

KY(J) = ((J-1)*HKY) - (KY1/2.0)
 C THE FOLLOWING IF STATEMENTS DETERMINE IMN
          IF ((KXM**2.0 .EQ. KX(I)**2.0).AND.
       4(KYN**2.0 .EQ. KY(J)**2.0))
       LIMN-LX:LY/4.0
          IF ((KXM**2.0 .EQ. KX(I)**2.0).AND.
       £(KYN**2.0 .NE. KY(J)**2.0))
       &IMN=LX*KYN*COS(KY(J)*LY/2.0)*(-1.0)**EN/
       £(KYN**2.0-KY(J)**2.0)
          IF ((KXM**2.0 .NE. KX(I)**2.0).AND.
      &(KYN**2.0 .EQ. KY(J) = *2.0))
&IMN-LY*KXM*COS(KX(I)*LX/2.0)*(-1.0)**EM/
      &(KXM##2.0-KX(I)##2.0)
      IF ((KXM**2.0 .NE. KX(I)**2.0).AND.

£(KYN**2.0 .NE. KY(J)**2.0))
       £IMN=4.0*KXM*KYN*COS(KX(I)*LX/2.0)*
      &COS(KY(J)*LY/2.0)*(-1.0)**EM*(-1.0)**EN/
&((KXM**2.0-KX(I)**2.0)*(KYN**2.0-
      &KY(J) ##2.0))
C THE FOLLOWING IF-STATEMENT TESTS IF THE EXPRESSION IS C. NEGATIVE FOR USE IN THE COMPLEX EXXPRESSION FOR COEF(I,J)
          IF (K**2.0-KX(I)**2.0-KY(J)
      £##2.0).55,.65, 65
         TEMP=CMPLX(((ABS(K**2.0-KX(I)**2.0-
      AXY(J) **2.0)) **.5) *(-2),0.0)
          GOTO 75
         TEMP=CMPLX(0.0,((K**2.0-KX(I)**2.0-
      4KY(J) = 2.0 = 0.5 = 2
         CONTINUE
C CALCULATE COEF
         COEF(I,J)=CEXP(TEMP) * IMN/
    4((KC**2.0-KX(I)**2.0-KY(J)**2.0)**.5*

4((KX(I)**2.0+KY(J)**2.0)**2.0-KPF))
 10
         CONTINUE
 ___ RETURN
         END
C ....
         SUBROUTINE OMEGAMNSUB(NIO, NUP, OMEGA. ROA. ACHA, DA. LX, LY)
  OMEGAMNSUB COMPUTES THE UPPER AND LOWER MODES WHICH THE PLATE
C RESPONSE IS SUMMED OVER. NLO IS THE LOWER LIMIT AND NUP IS THE
C_ UPPER LIMIT.
         INTEGER NLO, NUP, N11
         REAL OMEGA, ROA, ACHA, DA, LX, LY, OMEGAMNO, OMEGAMN1, OMEGAMN2, PI
PI-2.0*ASIN(1.0)
  INITIALIZE AND INCREMENT NUP
         NLO--1
         NLO-NLO+1
C CALCULATE RESONANT OMEGA FOR THE EN-NLO, EM-NLO MODE
         OMEGAMNO-(DA/(ROA*ACHA))**.5*(((2.0*NLO+1.0)*PI/LX)**2.0
      4+((2.0*NLO+1.0)*PI/LY)**2.0)
   IF THIS RESONANT OMEGA IS LARGER THAN OMEGA GO ON TO 258
```

C IF NOT INCREMENT NLO AND REPEAT
IF (OMEGANNO.GT.OMEGA) GOTO 258
GOTO 158
C_INITIALIZE AND INCREMENT NUP
358 NUP=NUP+1
C CALCULATE THE RESONANT OMEGAS FOR EN-NUP, EM-0 AND EN-0, EM-NUP
C MODES AND TEST IF LARGER THAN OMEGA OMEGAMN1=(DA/(ROA*ACHA))**.5*(((2.0*NUP+1.0)*PI/LX)**2.0
OMEGAMN2=(DA/(ROA*ACHA))**.5*((PI/LX)**2.0
G IF LARGER THAN OMEGA GO ON TO 458 IF NOT INCREMENT NUP , REPEAT
IF((OMEGAMN1.GT.OMEGA).OR.(OMEGAMN2.GT.OMEGA)) GOTO 458
GOTO 358
C ADD THREE MODES TO UPPER LIMIT
NUP-NUP+3
N11-NLO C_SUBTRACT THREE MODES FROM THE LOWER LIMIT, ZERO IS THE LOWEST NLO
NIO-NIO-3
IF(N11.EQ.1) NLO=0 IF(N11.EQ.2) NLO=0
WRITE (6.558) NLO.NUP
SSB FORMAT (215)
END
i

VARIABLE LIST  C DA - BENDING RIGIDITY OF THE FINITE PLATE C DB -BENDING RIGIDITY OF THE INFINITE PLATE C ETAA - DAMPING COEFICIENT FOR THE FINITE PLATE C ETAB = DAMPING COEFICIENT FOR THE INFINITE PLATE C LX & LY - DIMENSIONS OF THE FINITE PLATE C ROA - DENSITY OF THE INFINITE PLATE C ROB - DENSITY OF THE INFINITE PLATE C ACHA = THICKNESS OF THE INFINITE PLATE C ACHB - THICKNESS OF THE INFINITE PLATE C RO = DENSITY OF FLUID C XO & YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED C Z - DISTANCE BETWEEN THE PLATES C PRA - PRANDEL NUMBER FOR FLUID C GAMMA - SPECIFIC HEAT RATIO FOR FLUID C MU - VISCOSITY OF FLUID C MU - VISCOSITY OF FLUID C NU = POISON'S RATIO C C - SPEED OF SOUND IN FLUID E A - SHEER MODULUS OF THE FINITE PLATE E B - SHEER MODULUS OF THE INFINITE PLATE KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR	
C. DETERMINES THE TRANSMISSION LOSS BETWEEN CLATE-A AND PLATE-B. C. USING RMS VIBRATION LEVELS OF EACH PLATE C. WRITTEN BY HICHAEL F. SHAW  INTEGER CHEGAI, CHEGAB, CHEGAT, INC. EM, EN, I, J, ANROCEF, NCCOEF, LDCOEF, LDA, M,RIJO, NUP, NI1 PARAMETER (N-128) COMPLEX DSTAR CHEGAMINSQ, COEF (N,N), A(N,N), B(N,N), ABTIN,N), RFF, KC, M(M,N), MB(N,N), AT(N,N), B(N,N), ABTIN,N), RFF, KC, M(M,N), MB(N,N), AT(N,N), B(N,N), REAL WEFEL(4*N+15), WFFZ(4*N+15), CPY(N,N) REAL WEFEL(4*N+15), WFFZ(4*N+15), CPY(N,N) REAL WEREAL(N,N), WAREAL(N,N), WORK! (4000), WORK2(100), CHEGART REAL DA, DB, ETAA, ETAB, LX, LY, ROA, ROU, ACIIA, ACIIB, KX(N), KX(N), 4KXI, KYI, KYN, KYN, FRO, HP, XO, YO, INN. Z. PRA, GAMMA, MU,NU,C, E, 4KXI, KYI, KYN, FRO, HP, XO, YO, INN. Z. PRA, GAMMA, MU,NU,C, E, 4KXI, KYI, KYN, FRO, HP, XO, YO, INN. Z. PRA, GAMMA, MU,NU,C, E, 4KXI, KYI, KYN, FRO, HP, XO, YO, INN. Z. PRA, GAMMA, MU,NU,C, E, 4KXI, KYI, KYN, KYN, FRO, HP, XO, YO, INN. Z. PRA, GAMMA, MU,NU,C, E, 4KXI, KYI, KYN, KYN, FRO, HP, XO, YO, INN. Z. PRA, GAMMA, MU,NU,C, E, 4KXI, KYI, KYN, KYN, FRO, HP, XO, YO, INN. Z. PRA, GAMMA, MU,NU,C, E, 4KXI, KYI, KYN, KYN, FRO, HP, XO, YO, INN. Z. PRA, GAMMA, MU,NU,C, E, 4KXI, KYI, KYN, KYN, FRO, HP, XO, YO, INN. Z. PRA, GAMMA, MU,NU,C, E, 4KXI, KYI, KYN, KYN, FRO, HP, XO, YO, INN. Z. PRA, GAMMA, 4KXI, KY, EY, KYN, KYN, KYN, KYN, KYN, KYN, KYN, KY	OPCORAM PROTESTOR
C USING RNS VIERATION LEVELS OF EACH PLATE  C MITTER BY HICHAEL F. SHAW  INTEGER CHEGAI, CHEGAB, CHEGAT, INC. EH, EN, I, J,  ANRCOEF, NCCOEF, LDC, N, NID, NUP, NII  PARAMETER (N=128)  COMPLEX DSTAR CHEGAMNSQ, COEF(N,N), A(N,N), B(N,N),  ABT(N,N), RF, KC, MA(N,N), WB(N,N), AT(N,N), B(N,N),  REAL WETI(4***H)S), WFF2(4***H)S, CPY(N,N)  REAL WETI(4**H)S), WFF2(4***H)S, CPY(N,N)  REAL WETH, STAN, FRO, HP, XO, TO, INN, Z, PRA, GAMMA, MU, NU, C, E,  AND AMPA, AMPB, TAU, TL(200), COUNT, CHEGAI, CNEGAI, ACIDA, ACIDA, ACIDA,  AND	
C MRITTEN BY HICHAEL F. SHAW  INTEGER CHEGAI, CHEGAB, CHEGAT, INC. EH, EN, I, J,  ANRODEF, NCCOEF, LDCOEF, LDA, N, NLO, NUP, NII  PARAMETER (N-128)  COMPLEX DSTAR CHEGAMNSO, COEF (N.N.), A(N.N.), B1(N.N.),  ABTIN.N.), RFF. KC, HA(N.N.), MB(N.N.), ATIN.N.), B(N.N.),  ABTIN.N.), RFF. KC, HA(N.N.), MB(N.N.), ATIN.N.), B(N.N.),  REAL HEREAL(N.N.), MAREAL(N.N.), MORK! (4000), MORK2(100),  REAL HEREAL(N.N.), MAREAL(N.N.), MORK! (4000), MORK2(100), CHEGART  REAL DA. DB. ETAA, ETAB, LX, LY, ROA, ROU, ACIDA, ACIDA, KX(N.), XX(N.),  AKXI, KYI, KXM, KYN, FRO. HP, XO, YO, INN. Z. PRA, AGAMMA, MU, NU, C.E.,  AINX, HKY, PI, K, KP, CHEGA, CHEGANNO, CHEGARNI, CHEGARNIZ  INTRINSIC CHEM.  C EXTERNAL F2T2B, FFTCI  C THE MEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS  COMMON AVRKSEY RIMSE  REAL RAKES(18864)  C DA - BENDING RIGIDITY OF THE FINITE PLATE  C DB - BENDING RIGIDITY OF THE FINITE PLATE  C DB - BENDING RIGIDITY OF THE FINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE FINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE FINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE INFINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE INFINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE INFINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE INFINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE INFINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE INFINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE INFINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE INFINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE INFINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE INFINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE INFINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE INFINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE INFINITE PLATE  C ETAB - DAMPHING COSEPICIENT FOR THE INFINITE PLATE  C ACIDA - THICKNESS OF THE INFINITE PLATE  C ACIDA - THICKNESS OF THE INFINITE PLATE  C ACIDA - THICKNESS OF THE INFINITE PLATE  C C - SPEED OF SOUND IN FLUD  C -	
INTEGER CHEGAI, CHEGAB, CHEGAT, INC. EH, EN, I, J,  **ANRCOEF, NCCOEF, LDCOEF, LDA, N. NIO, NUP, NII  PARAMETER (N-128)  COMPLEX DSTAR CHEGAMNSQ, COEF(N.N), A(N.N), B1(N.N),  &BT(N.N), KPF, KC. NA(N.N), WB(N.N), AT(N.N), B1(N.N),  &BT(N.N)  REAL WFEI(4*N+15), WFFZ(4*N+15), CPY(N.N)  REAL WFEI(4*N+15), WFFZ(4*N+15), WFEI(4*N+15), WFEI(4	to USING RMS VIGRATION DEVELO OF EACH FLATE
INTEGER CHEGAI, CHEGAB, CHEGAT, INC. EH, EN, I, J,  **ANRCOEF, NCCOEF, LDCOEF, LDA, N. NIO, NUP, NII  PARAMETER (N-128)  COMPLEX DSTAR CHEGAMNSQ, COEF(N.N), A(N.N), B1(N.N),  &BT(N.N), KPF, KC. NA(N.N), WB(N.N), AT(N.N), B1(N.N),  &BT(N.N)  REAL WFEI(4*N+15), WFFZ(4*N+15), CPY(N.N)  REAL WFEI(4*N+15), WFFZ(4*N+15), WFEI(4*N+15), WFEI(4	C LOTHERN DY MICHAET P CUBM
INTEGER OMEGAI, OMEGAB, OMEGAT, INC. EM, EN, I, J,  ANRICOEP, NCCOSE, LLOCEF, LDA, NILO, NUP, NII  PARAMETER (N-128)  COMPLEX DSTAR, OMEGAMINSO, COEF(N,N), A(N,N), B1(N,N),  EMT(N,N), KPF, KC, HA(N,N), WB(N,N), AT(N,N), B1(N,N),  EACH, WFF1(4*N+15), WFF2(4*N+15), CPY(N,N)  REAL WFF1(4*N+15), WFF2(4*N+15), CPY(N,N)  REAL WFF1(4*N+15), WFF2(4*N+15), CPY(N,N)  REAL WERDAL(N,N), MARGAL(N,N), MORKI(4000), WORK2(100),  SAMPA, AMPB, TAU, TL(200), COUNT, OMEGAI, OMEGAZ, X1(200), OMEGART  REAL DA, DB, ETAA, ETAB, LX, LX, ROA, ROUB, ACIDA, ACIB, RX(N), KY(N),  SKX1, KY1, KXM, KYN,F, RO, MP, XO, YO, IMN, Z, PRA, GAMMA, MU, NU, C, E.  SIKX, HKY, PI, K, RY, OMEGA, OMEGAMNO, OMEGAMNI, OMEGAMNA UNIC, E.  SIKX, HKY, PI, K, RY, OMEGA, OMEGAMNO, OMEGAMNI, OMEGAMNA UNIC, E.  EXTERNAL FITATE, FTCI  C THE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS  COMMON WORKSP, CHASE  C CHANDA WORKSP, CHASE  C TAB - BENDING RIGIDITY OF THE FINITE PLATE  C DB - BENDING RIGIDITY OF THE FINITE PLATE  C DB - BENDING RIGIDITY OF THE FINITE PLATE  C ETAB - DAMPING COEFICIENT FOR THE FINITE PLATE  C ETAB - DAMPING COEFICIENT FOR THE FINITE PLATE  C LX & LY - DIMENSIONS OF THE FINITE PLATE  C ROA - DENSITY OF THE FINITE PLATE  C ROA - DENSITY OF THE FINITE PLATE  C ACID - THICKNESS OF THE FINITE PLATE  C ACID - THICKNESS OF THE FINITE PLATE  C ACID - THE POINT WHERE THE INPUT FORCE F IS APPLIED  X O & YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED  X O E YOUR BOOK OF THE STATE OR FLUID  MU - VISCOSITY OF FLUID  MU - POISON'S RATIO  C - SPEED OF SOUND IN FLUID  EA - SHEER MODULUS OF THE FINITE PLATE  EB - SHEER MODULUS OF THE FINITE PLATE  EB - SHEER MODULUS OF THE FINITE PLATE  EB - SHEER MODULUS OF THE FINITE PLATE  EN - PORMATER A, FRA DAMPA BOOK ON THE STATUS ON THE STA	
ANRCOEF, NCCOEF, LDO. N, NLD, NUP. N11  PARMETER (N-128)  COMPLEY DSTAR, CHEGAMINSC, COEF(N.N.), A(N.N.), B1(N.N.),  BET(N.N.), KEP, KC, WA(N.N.), WB(N.N.), AT(N.N.), B(N.N.),  BET(N.N.), KEP, KC, WA(N.N.), WB(N.N.), AT(N.N.), B(N.N.),  REAL WFF1(4*N*15), WFF2(4*N*15), CPY(N.N.)  REAL WFRI(4*N*15), WFF2(4*N*15), CPY(N.N.)  REAL WERBAL(N.N.), WAREAL(N.N.), WORK! (1400), WORK2(100),  SAMPA, A-PB, TAU, TI, 200), COUNT, OMEGA!, OMEGAZ, X1(200), OMEGART  REAL DA. DB. ETAA, ETAB, LY, LY, ROA, ROU, ACIIB, ACIIB, XK(N.), KY(N.),  SKIL, KY, LXM, KNY, F. RO. MP, XO, YO, INN. 2, PTRA, GAMPHA, MU, NU, C. E.,  SHIKK, HKY, PJ, K, KP, COMEGA, OMEGAMNO, OMEGAMNO!, OMEGAMNO  INTRINSIC CUPIX  EXTERNAL FITZB, FFTCI  C THE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS  COMMON WORKSEY RWKSP  REAL RWKSP(8884)  C VARIABLE LIST  C DA - BENDING RIGIDITY OF THE FINITE PLATE  C DA - BENDING RIGIDITY OF THE INFINITE PLATE  C ETAA - DAMPING COEFICIENT FOR THE INFINITE PLATE  C ETAB - DAMPING COEFICIENT FOR THE INFINITE PLATE  C ETAB - DAMPING COEFICIENT FOR THE INFINITE PLATE  C ROA - DENSITY OF THE FINITE PLATE  C ROA - DENSITY OF THE FINITE PLATE  C ROB - DENSITY OF THE FINITE PLATE  C ROB - DENSITY OF THE INFINITE PLATE  C ROB - DENSITY OF FLUID  C XO 4 YO - THE POINT HHERE THE INPUT FORCE F IS APPLIED  C Z - DISTANCE BETWEEN THE PLATES  PRA - PRANDEL NUMBER FOR FLUID  MU - YISCOSITY OF FLUID  MU - YISCOSITY OF FLUID  MU - POISON'S RATIO  C - SPEED OF SOUND IN FLUID  EA - SHEER HODULUS OF THE INFINITE PLATE  E B - SHEER HODULUS OF THE INFINITE PLATE  E B - SHEER HODULUS OF THE INFINITE PLATE  E B - SHEER HODULUS OF THE INFINITE PLATE  EXI! - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F-1.0)  INTUIT FORCE TO THE FRINTE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-26, FILE-"PRIOO.DAT", STATUS-"NEW")  PARAMETER (F-1.0)  INTUIT FORCE TO THE FROM PR. DAT  READ (25, 25) NO. ROB. RO. ETAM, ETABL GAMMA, PRA  FORMAT(18*A, 7.8*B., 7.16*A, 7.78*B., 6)  FORMAT(18*A, 7.8*B., 7.16*A, 7.78*B., 7.10*A, 7.10*A  FORMAT(18*A,	TARREST AND AND AND THE PARTY OF THE PARTY O
PARAMETER (N=128)  COMPLEX DSTAR, OMEGAMNSO, COEF(N.N), A(N.N), B1(N.N),  &BT(N.N), KPF, KC, HA(N.N), WB(N.N), AT(N.N), B(N.N),  &BCAL, MFPI(4*N+15), MFP2(4*N+15), CPY(N.N)  REAL MFPI(4*N+15), MFP2(4*N+15), CPY(N.N)  REAL MFPI(4*N+15), MFP2(4*N+15), CPY(N.N)  REAL MFPI(4*N+15), MFP2(4*N+15), CPY(N.N)  REAL MFREAL(N.N), MAREAL(N.N), MORKI(4000), MORKZ(100),  &MFA, AMPB, TAU, TL(200), COUNT, OMEGAL, CMEGAZ, X1(200), OMEGART  REAL DA, DB, ETAA, ETAB, LTR, LY, ROX, ROX, ACIDA, ACIDA, KY(N), KY(N),  &KXI, KYI, KXM, KYN, F, RO, MP, XO, YO, IMN, Z, PTA, GAMMA, MU, NU, C, E,  &MIXINITY, PI, K, KP, CMEGA, OMEGAMNO, OMEGAMNI, OMEGAMNA  INTRINSIC CMPLX  EXTERNAL FITZB, FFTCI  C THE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS  COMMON AGMEST RHASP  REAL RWASP(8884)  C VARIABLE LIST  C DA - BENDING RIGIDITY OF THE FINITE PLATE  C DB - BENDING RIGIDITY OF THE INFINITE PLATE  C DB - BENDING RIGIDITY OF THE INFINITE PLATE  C DB - BENDING RIGIDITY OF THE INFINITE PLATE  C DB - BENDING SEPTICIENT FOR THE INFINITE PLATE  C DA - DENSITY OF THE INFINITE PLATE  C ACIDA - THICKNESS OF THE FINITE PLATE  ACIDA - THICKNESS OF THE INFINITE PLATE  C ACIDA - THICKNESS OF THE INFINITE PLATE  C C DENSITY OF FLUID  C XO 4 OF THE POINT MHERE THE INPUT FORCE F IS APPLIED  C O - THE POINT MHERE THE INPUT FORCE F IS APPLIED  C O - THE POINT MHERE THE INPUT FORCE F IS APPLIED  C C - SPEED OF SOUND IN FLUID  G MU - VISCOSITY OF FLUID  MU - POISON'S RATIO  C C - SPEED OF SOUND IN FLUID  E A - SHEER MODULUS OF THE INFINITE PLATE  E B - SHEER MODULUS OF THE INFINITE PLATE  E B - SHEER MODULUS OF THE INFINITE PLATE  E B - SHEER MODULUS OF THE INFINITE PLATE  E B - SHEER MODULUS OF THE INFINITE PLATE  E B - SHEER MODULUS OF THE INFINITE PLATE  E B - SHEER MODULUS OF THE INFINITE PLATE  E B - SHEER MODULUS OF THE INFINITE PLATE  E B - SHEER MODULUS OF THE INFINITE PLATE  E B - SHEER MODULUS OF THE FINITE PLATE  E B - SHEER MODULUS OF THE INFINITE PLATE  FORM C STAR SHAPE OF THE PROME OF THE PLATE IN Y DIR  FORM C STAR SHAPE OF THE PROME OF THE PLAT	
COMPLEY DSTAR, GMEGAMINSO, COEF(N.N.), A(N.N.), BL(N.N.),  ABT(N.N.), KEP, KC, MA(N.N.), WB(N.N.), AT(N.N.), B(N.N.),  ABC(N.N.)  REAL MFP1(4*N*15), MFP2(4*N*15), CPY(N.N.)  REAL MFREAL(N.N.), MAREAL(N.N.), MORK! (4000), MORK2(100),  AMPA A.MBB, TAU, TL(200), COUNT OMEGAL (AMEGA, X!(200), OMEGART  REAL DA, DB, ETTA, ETTB, LX, LY, ROA, ROU, ACIB, ACIB, KY(N.), KY(N.),  KKXI, KXI, KXH, KYN.P, RO.MP, XO.YO, INN.Z, PRA, GAMHA, MU, NU, C, E,  SINKI, HKY, PI, K. MP, COMP, XO.YO, INN.Z, PRA, GAMHA, MU, NU, C, E,  SINKI, HKY, PI, K. MP, COMP, XO.YO, INN.Z, PRA, GAMHA, MU, NU, C, E,  SINKI, HKY, PI, K. MP, COMP, XO.YO, INN.Z, PRA, GAMHA, MU, NU, C, E,  SINKI, HKY, PI, K. MP, COMP, XO.YO, INN.Z, PRA, GAMHA, MU, NU, C, E,  SINKI, HKY, PI, K. MP, COMP, XO.YO, INN.Z, PRA, GAMHA, MU, NU, C, E,  SINKI, HKY, PI, K. MP, COMP, XO.YO, INN.Z, PRA, GAMHA, MU, NU, C, E,  SINKI, HKY, PI, K. MP, COMP, XO.YO, INN.Z, PRA, GAMHA, MU, NU, C, E,  SINKI, HKY, PI, K. MP, COMP, XO.YO, INN.Z, PRA, GAMHA, MU, NU, C, E,  SINKI, HKY, PI, K. MP, CAN, COMP, AND COMP,	
SETIN, N.), KPF, KC, HAIN, N.), ATMIN, ATMIN, ATMIN, N.), ATMIN, N.)  SEAL WETPI (4*N+15), WETPI (4*N+15), CPY(N, N)  REAL WETPI (4*N+15), WETPI (4*N+15), CPY(N, N)  REAL WERBALL(N, N), MAREAL(N, N), MORKI (4000), WORKZ (100),  SAMPA, AMPB, TAU, TL (200), COUNT, OMEGAI, CMEGAZ, XI (200), OMEGART  REAL DA, DB, ETTA, ETTA, ETTA, LIX, KOA, ROUB, ACIB, ACIB, KX (N), KY(N),  SKXI, KYI, KWM, KYN, F, RO, MP, XO, XO, INN, Z, PRA, GAMMA, MU, NU, C, E,  SHIKK, HKY, PI, K, NP, COMEGA, OMEGANNO, OMEGANNI, OMEGANNI  CHINE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS  COMMON / MORKSPY RNKSP  REAL RWKSP (8884)  C VARIABLE LIST  C DA - BENDING RIGIDITY OF THE FINITE PLATE  C DB - BENDING RIGIDITY OF THE INFINITE PLATE  C DB - BENDING RIGIDITY OF THE INFINITE PLATE  C ETTA - DAMPING COEFICIENT FOR THE INFINITE PLATE  C ETTA - DAMPING COEFICIENT FOR THE INFINITE PLATE  C ETTA - DAMPING COEFICIENT FOR THE INFINITE PLATE  C ROA - DENSITY OF THE FINITE PLATE  C ROB - DENSITY OF THE FINITE PLATE  C ROB - DENSITY OF THE INFINITE PLATE  C ROB - DENSITY OF FLUID  C O - THE POINT WHERE THE INPUT FORCE F IS APPLIED  C O - THE POINT WHERE THE INPUT FORCE F IS APPLIED  C O - THE POINT WHERE THE INPUT FORCE F IS APPLIED  C O - THE POINT WHERE THE INPUT FORCE F IS APPLIED  C C - SPEED OF SOUND IN FLUID  MU - POISONSTY OF FLUID  MU - POISONSTY OF FLUID  MU - POISONS RATIO  C C - SPEED OF SOUND IN FLUID  E A - SHEER MODILUS OF THE INFINITE PLATE  E A - SHEER MODILUS OF THE INFINITE PLATE  E B - SHEER MODILUS OF THE INFINITE PLATE  E KYI - UPPER WAVENUBEER LIHTT IN FINITE PLATE  E MY - UPPER WAVENUBEER LIHTT IN FINITE PLATE  E MY - SHOW LINES ON CAN BE LARGER THAN 64  READ (25,15) LY, LY, XO, XO, ACHA, ACHB  T FORMAT(184, 2,126, 6)  T FORMAT(184, 2,126	PARAMETER (N-128)
ANCIN.N)  REAL WFF1(4*N*15), WFF2(4*N*15), CPY(N,N)  REAL WFF1(4*N*15), WFF2(4*N*15), CPY(N,N)  REAL WFF1(4*N*15), WFREAL(N,N), WORK1(4000), MORK2(100),  AMPA, AMPB, TAU TL(1200), COUNT.OMEGAL, OMEGAZ, X1(200), CMEGART  REAL DA, DB, ETAA, ETAB, LX, LY, ROA ROU, ACIDA, ACIDA, KX(N),  AKXI, KXY, KXM, KXM, PR, BO, MP, XO, YO, INN, Z, PIRA, CAMMA, MU, NU, C, E,  SINKI, HKY, PI, K, XP, CMEGA, CMEGAMNO, CMEGAMNO, CMEGAMNA  EXTERNAL FITZB, EFFCI  C THE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS  COMMON FORMSEY, RAKSSP  REAL WRKSP(6884)  C VARIABLE LIST  C DA - BENDING RIGIDITY OF THE FINITE PLATE  C DB - BENDING RIGIDITY OF THE INFINITE PLATE  C ETAB - DAMPING COEFICIENT FOR THE INFINITE PLATE  C ETAB - DAMPING COEFICIENT FOR THE INFINITE PLATE  C TO A COMMON FOR THE FINITE PLATE  C ROA - DENSITY OF THE INFINITE PLATE  C ACID - THICKNESS OF THE FINITE PLATE  C ACID - THE POINT WHERE THE INPUT FORCE F IS APPLIED  C T - DISTANCE BETWEEN THE PLATES  C PRA - PRANDEL NUMBER FOR FLUID  MU - VISCOSITY OF THE INFINITE PLATE  E B - SHEER MODULUS OF THE INFINITE PLATE  E B - SHEER MODULUS OF THE INFINITE PLATE  E B - SHEER MODULUS OF THE INFINITE PLATE  C MY - THE PLATE IN THE PLATE IN THE PLATE  C ACID - SHEER MODULUS OF THE FINITE PLATE  E B - SHEER MODULUS OF THE FINITE PLATE  E B - SHEER MODULUS OF THE FINITE PLATE  E B - SHEER MODULUS OF THE FINITE PLATE  E B - SHEER MODULUS OF THE FINITE PLATE  E B - SHEER MODULUS OF THE FINITE PLATE  FORMITTER (F-1.0)  INTUIT FORCE TO THE FINITE PLATE IN Y DIR  KX1 - UPPER MAYENUMERE LIMIT IN FINITE PLATE  FORMITTER (F-1.0)  INTUIT FORCE TO THE FINITE PLATE IN SASUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-26, FILE-'PRILODO.CUT', STATU	COMPLEX DSTAR, OMEGAMNSQ, COEF(N, N), A(N, N), B1(N, N),
REAL WIFE(IA, N.) WAREA(IA, N.) WORK) (4000), WORK2 (100),  AMPA, AMPB, TAU TL (200), COUNT. OMEGAL CAMEGAZ, X1 (200), CMEGAT  REAL DA, DB, ETAA, ETAB, LIX, LY, ROA, ROB, ACID, ACID, MAN, XYIN,  4KX1, KY1, KXM, KYN, P, RO, MP, XO, YO, IMN, Z, PRA, GAMMA, MU, NU, C, E,  SINKI, HKY, PI, X, RP, CMEGA, CMEGAMNO, CMEGAMNO, CMEGAMNO, MEGAMNOZ  INTRINSIC CIPLX  EXTERNAL FZT2B, FPCI  C THE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS  COMMON AWORRSP, RWKSP  REAL RKKSP(B884)  C VARIABLE LIST  C DA - BENDING RIGIDITY OF THE FINITE PLATE  C DB - BENDING RIGIDITY OF THE FINITE PLATE  C DB - BENDING RIGIDITY OF THE INFINITE PLATE  C ETAA - DAMPING COEFICIENT FOR THE FINITE PLATE  C ETAB - DAMPING COEFICIENT FOR THE FINITE PLATE  C ROA - DENSITY OF THE FINITE PLATE  C ROA - DENSITY OF THE FINITE PLATE  C ROB - DENSITY OF THE FINITE PLATE  C ROB - DENSITY OF THE INFINITE PLATE  C ROB - DENSITY OF THE INFINITE PLATE  C ACID - THICKNESS OF THE FINITE PLATE  C ACID - THE POINT WHERE THE INFINITE PLATE  C ACID - THE POINT WHERE THE INFINITE PLATE  C ACID - THE POINT WHERE THE PLATE  C ACID - THE POINT WHERE THE INFINITE PLATE  C ACID - THE POINT WHERE THE INFINITE PLATE  C ACID - THE POINT WHERE THE INFINITE PLATE  C ACID - THE POINT WHERE THE INFINITE PLATE  C ACID - THE POINT WHERE THE INFINITE PLATE  C ACID - THE POINT WHERE THE INFINITE PLATE  C ACID - THE POINT WHERE THE INFINITE PLATE  C ACID - THE POINT WHERE THE INFINITE PLATE  C ACID - THE POINT WHERE THE INFINITE PLATE  C ACID - THE POINT WHERE THE INFINITE PLATE  C ACID - THE POINT WHERE THE	[
REAL HRREAL(N.N), WAREAL(N.N), MORKI(4000), MORK2(100),  AMPA, AMPB, TAU TL(200), COUNT. OMEGAI, OMEGAS, X1(200), OMEGART  REAL DA. DB. ETAA. ETAB. LX.LY, ROA. ROB. ACHA. ACHB. KX(N),  AKXI, KYN, KWN, KWN, PR. ON, PW, XO, YO, IMN. Z. PRA. CARMA. MU, NU, C, E,  AKIK, KYI, KYN, KWN, PR, ON, PW, XO, YO, IMN. Z. PRA. CARMA. MU, NU, C, E,  AKIK, KYI, KYN, KWN, PR, ON, PW, XO, YO, IMN. Z. PRA. CARMA. MU, NU, C, E,  AKIK, KYN, PI, X, KP, CMEGA. OMEGAMNO, OMEGAMNO, OMEGAMNO,  INTRINSIC CMPLY.  CTHE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS  COMMON MORREY RINES  REAL RINES (8884)  C VARIABLE LIST  C DA - BENDING RIGIDITY OF THE FINITE PLATE  C DA - BENDING RIGIDITY OF THE INFINITE PLATE  C DA - BENDING RIGIDITY OF THE FINITE PLATE  C ETAB - DAMPING COEFICIENT FOR THE INFINITE PLATE  C ETAB - DAMPING COEFICIENT FOR THE INFINITE PLATE  C ROA - DENSITY OF THE FINITE PLATE  C ROA - DENSITY OF THE FINITE PLATE  C ROA - DENSITY OF THE FINITE PLATE  C ACHB - THICKNESS OF THE FINITE PLATE  C ACHB - THICKNESS OF THE INFINITE PLATE  C ACHB - THICKNESS OF THE INFINITE PLATE  C C DEASITY OF FLUID  C XO 4 YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED  C Z - DISTANCE BETWEEN THE PLATES  PRA - PRANDEL NUMBER FOR FLUID  C MU - POISON'S RATIO  C MU - POISON'S RATIO  C - SPEED OF SOUND IN FLUID  E A - SHEER MODULUS OF THE FINITE PLATE  EB - SHEER MODULUS OF THE FINITE PLATE  EB - SHEER MODULUS OF THE INFINITE PLATE  KXI - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  C XY - THE POINT PROBLEM LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F-1.0)  IMPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-25, FILE-'PRICOOO, DAT', STATUS-'OLD')  OPEN (UNIT-25, FILE-'PRICOOO, DAT', STATUS-'NEW')  *** PORMATIFER	
AMPA, AMPB, TAU, TL(200), COUNT. CHEGAI, CHEGAZ, XI(200), OMEGART REAL DA.DB. ETAA, ETAB. LIX. LY. RO, ADD. ACID. ACID. RCIN., XY(N),  &KXI. KYI. KXM, KYN. F. RO. MP. XO, YO. IMN. Z. PIRA, GAMMA. MU. NU. C. E.  &INTRINSIC CHPLX EXTERNAL FIZZB. FFTCI  C THE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS  COMMON /MORKSP/ RWKSP REAL RWKSP/ R8MSP REAL RWKSP REAL RWKSP/ R8MSP REAL RWKSP/ R8MSP REAL RWKSP/ R8MSP REAL RWKSP REAL RWKSP/ R8MSP R	REAL WFF1(4=N+15), WFF2(4=N+15), CPY(N,N)
REAL DA DB. ETAA. ETAB. LY. LY. ROA. ROD. ACHA. ACHB. KY(N), KY(N),  KXI, KYI, KYN. KYN. FR. ON PY. XO. YO. HYN. Z. PRA. GAMMA. MU., PU. C. E.  SHIKX. HXY. PI. K. KY. ONEGA. OMEGAMNO, OMEGAMNI, OMEGAMNZ  INTRINSIC COMPLY  EXTERNAL FZTZB. FFTCI  C THE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS  COMMON /WORKSPY RWASP  REAL RWASP(8884)  C VARIABLE LIST  C DA - BENDING RIGIDITY OF THE FINITE PLATE  C DB - BENDING RIGIDITY OF THE INFINITE PLATE  C DB - BENDING RIGIDITY OF THE INFINITE PLATE  C ETAB DAMPING COEFICIENT FOR THE INFINITE PLATE  C ETAB DAMPING COEFICIENT FOR THE INFINITE PLATE  C ETAB DAMPING COEFICIENT FOR THE INFINITE PLATE  C ROB - DENSITY OF THE FINITE PLATE  C ROB - DENSITY OF THE INFINITE PLATE  C ROB - DENSITY OF THE INFINITE PLATE  C ACHB THICKNESS OF THE INFINITE PLATE  C ACHB THICKNESS OF THE INFINITE PLATE  C ACHB THICKNESS OF THE INFINITE PLATE  C AC - DENSITY OF FLUID  C XO & YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED  C Z - DISTANCE BETWEEN THE PLATES  PRA - PRANDEL NUMBER FOR FLUID  C MU - VISCOSITY OF FLUID  C MU - PUSCOSITY OF FLUID  C MU - POISON'S RATIO  C C - SPEED OF SOUND IN FLUID  C MU - POISON'S RATIO  C C - SPEED OF SOUND IN FLUID  EA - SHEER MODULUS OF THE INFINITE PLATE  EKXI - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  KXI - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  KXI - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  C PARAMETER (F-1.0)  INPUT PORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-25, FILE-'PRIJODO.CUT', STATUS-'OLD')  OPEN (UNIT-26, FILE-'PRIJODO.CUT', STATUS-'OLD')  OPEN (UNIT-26, FILE-'PRIJODO.CUT', STATUS-'NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL INKIN 1884)  READ (25,15) HU, C, EA, EB, KXI, KXI  FORMATICER, FR. 3, ZEB 3, ZEB 2, PR. 2, PR. 6)  TORMATICER, FR. 3, ZEB 3, ZEB 2, PR. 2, PR. 6)  TORMATICER, FR. 3, ZEB 3, ZEB 2, PR. 2, PR. 6)  TORMATICER, FR. 3, ZEB 3, ZEB 2, PR. 2, PR. 6)  COMPUTE THE VALUE OF PI  PI-2. **ASINITAL**  **TOTAL THE TIME TOWN TO THE PILL THE THE THE THE T	REAL WBREAL(N.N), WAREAL(N.N), WORKI(4000), WORKZ(100),
AKX1 KY1 KYM, KYN F, RO.MP. XO.YO.IMM.Z.PRA.GAMMA.MU.NU.C.E.  SIKX HKY, PJ.K. KP. OMEGA.OMEGAMNO.OMEGAMN1.OMEGAMN2 INTRINSIC CMPLX EXTERNAL FITES.FTCI C THE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS COMMON /WORKSP/ RWKSP REAL RWKSP(8884) C	
SHEX HEY. PI.K. KP. OMEGA. OMEGAMNO, OMEGAMNI, OMEGAMN2 INTRINSIC COMPLY EXTERNAL F2T2B, FFTCI CTHE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS COMMON WORKSPY RWASP REAL RWASP(8884) C VARIABLE LIST CD A BENDING RIGIDITY OF THE FINITE PLATE CD BE HENDING RIGIDITY OF THE INFINITE PLATE CD BE HENDING RIGIDITY OF THE INFINITE PLATE CD BE HENDING RIGIDITY OF THE FINITE PLATE CD LIKE LY DIMENSIONS OF THE FINITE PLATE CO LIKE LY DIMENSIONS OF THE FINITE PLATE CO ROB DENSITY OF THE INFINITE PLATE CO ROB DENSITY OF THE INFINITE PLATE CO ACIA THICKNESS OF THE FINITE PLATE CO ACIA THE POINT WHERE THE INPUT FORCE F IS APPLIED CO ACIA SPECIE (HEAT RATIO FOR FLUID CO ACIA SPECIE (HEAT RATIO FOR FLUID CO AND POISON'S RATIO CO SPEED OF SOUND IN FLUID CO AND POISON'S RATIO CO SPEED OF SOUND IN FLUID CO AND POISON'S RATIO CO SPEED OF SOUND IN FLUID CO AND POISON'S RATIO CO SPEED OF SOUND IN FLUID CO AND PROMORD AND AND AND AND AND AND AND AND AND AN	
INTRINSIC CHPLX EXTERNAL FITTB, FFTCI C THE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS COMMON WORKSPY RWKSP REAL RWKSP (8884)  C VARIABLE LIST C DA - BENDING RIGIDITY OF THE FINITE PLATE C DB -BENDING RIGIDITY OF THE INFINITE PLATE C ETAR - DAMPING COEFICIENT FOR THE FINITE PLATE C ETAB - DAMPING COEFICIENT FOR THE INFINITE PLATE C LI & LY - DIMENSIONS OF THE FINITE PLATE C C LX & LY - DIMENSIONS OF THE FINITE PLATE C C ACIA - THICKNESS OF THE INFINITE PLATE C ACIB - THICKNESS OF THE INFINITE PLATE C C ACIB - THICKNESS OF THE INFINITE PLATE C C ACIM - THICKNESS OF THE INFINITE PLATE C C ACIM - THE POINT WHERE THE INPUT FORCE F IS APPLIED C C - SENSITY OF FLUID C MU - VISCOSITY OF FLUID C MU - VISCOSITY OF FLUID C MU - POISON'S RATIO C C - SPECD OF SOUND IN FLUID C MU - POISON'S RATIO C C - SPECD OF SOUND IN FLUID C EA - SHEER MODULUS OF THE INFINITE PLATE E B - SHEER MODULUS OF THE INFINITE PLATE E B - SHEER MODULUS OF THE INFINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINITE PLATE C XX - UPPER WAVENUMBER LIMIT IN FINIT	
EXTERNAL F722B, FFTCI C THE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS COMMON /WORKSP/ RWKSP REAL RWKSP(8884) C VARIABLE LIST C DA - BENDING RIGIDITY OF THE FINITE PLATE C DB - BENDING RIGIDITY OF THE INFINITE PLATE C DB - BENDING RIGIDITY OF THE INFINITE PLATE C ETAA - DAMPING COEFICIENT FOR THE INITIPITE PLATE C ETAB - DAMPING COEFICIENT FOR THE INFINITE PLATE C LX & LY - DIMENSIONS OF THE FINITE PLATE C ROA - DENSITY OF THE INFINITE PLATE C ROB - DENSITY OF THE FINITE PLATE C ACIA = THICKNESS OF THE FINITE PLATE C ACIA = THICKNESS OF THE FINITE PLATE C ACIA = THICKNESS OF THE INFINITE PLATE C RO : DENSITY OF FLUID C NO & YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED C Z - DISTANCE BETWEEN THE PLATES C PRA - PRANDEL NUMBER FOR FLUID C MU - VISCOSITY OF FLUID C MU - VISCOSITY OF FLUID C C - SPEED OF SOUND IN FLUID C MU - VISCOSITY OF THE INFINITE PLATE C EB - SHEER MODULUS OF THE INFINITE PLATE C EB - SHEER MODULUS OF THE INFINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY - UPPER WAVENUMBER LIMIT IN FI	
C THE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS  COMPON **ORNSP*/ RYKSP* REAL RWKSP(8884)  C VARIABLE LIST  C DA - BENDING RIGIDITY OF THE FINITE PLATE C DB -BENDING RIGIDITY OF THE INFINITE PLATE C FIRA - DAMPING COEFICIENT FOR THE INFINITE PLATE C ETAB - DAMPING COEFICIENT FOR THE INFINITE PLATE C AS LY - DIMENSIONS OF THE FINITE PLATE C ROA - DENSITY OF THE INFINITE PLATE C ROB - DENSITY OF THE INFINITE PLATE C ACIA - THICKNESS OF THE INFINITE PLATE C ACIB - THE POINT WHERE THE INPUT FORCE F IS APPLIED C C - SPECIFIC HEAT RATIO FOR FLUID C MU - VISCOSITY OF FLUID C MU - POISON'S RATIO C C - SPEED OF SOUND IN FLUID C MU - POISON'S RATIO C C - SPEED OF SOUND IN FLUID C EA - SHEER MODULUS OF THE INFINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C KX1 - UPPER WAVENUMBER C KX1 - UPPER	
COMMON /MORKSP/ RWKSP  REAL RWKSP(8884)  C VARIABLE LIST  C DA - BENDING RIGIDITY OF THE FINITE PLATE C DB - BENDING RIGIDITY OF THE INFINITE PLATE C DB - BENDING RIGIDITY OF THE INFINITE PLATE C ETAA - DAMPING COEFICIENT FOR THE INTITE PLATE C ETAB - DAMPING COEFICIENT FOR THE INTITE PLATE C LX & LY - DIMENSIONS OF THE FINITE PLATE C ROB - DENSITY OF THE INFINITE PLATE C ROB - DENSITY OF THE INFINITE PLATE C ACIA = THICKNESS OF THE FINITE PLATE C ACIA = THICKNESS OF THE INFINITE PLATE C ACIA = SPECIFIC HEAT RATIO FOR FLUID C C - SPED OF SOUND IN FLUID C C - SPEED OF SOUND IN FLUID C MU - VISCOSITY OF FLUID C MU - VISCOSITY OF FLUID C C - SPEED OF SOUND IN FLUID C C - SPEED OF SOUND C C - SPEED OF SOUND C C - SPEED OF SOUND C C - SPEE	
REAL RWKSP(8884)  C VARIABLE LIST  C DA - BENDING RIGIDITY OF THE FINITE PLATE  C DB - BENDING RIGIDITY OF THE INFINITE PLATE  C ETAA - DAMPING COEFICIENT FOR THE INFINITE PLATE  C ETAB - DAMPING COEFICIENT FOR THE INFINITE PLATE  C LX 4 LY - DIMENSIONS OF THE INFINITE PLATE  C ROA - DENSITY OF THE FINITE PLATE  C ACIA - THICKNESS OF THE FINITE PLATE  C ACIA - THICKNESS OF THE INFINITE PLATE  C ACHB - THICKNESS OF THE INFINITE PLATE  C ACHB - THE POINT WHERE THE INPUT FORCE F IS APPLIED  C Z - DISTANCE BETWEEN THE PLATES  C Z - DISTANCE BETWEEN THE PLATES  C PRA - PRANDEL NUMBER FOR FLUID  C MU - VISCOSITY OF FLUID  C MU - POISON'S RATIO  C - SPEED OF SOUND IN FLUID  C MU - POISON'S RATIO  C C - SPEED OF SOUND IN FLUID  E A - SHEER MODULUS OF THE FINITE PLATE  E B - SHEER MODULUS OF THE INFINITE PLATE  E K11 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F-1.0)  C INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-25, FILE-'PRIDOO.DAT', STATUS-'NEW')  ANOTHER LINES ON CAN BE LARGER THAN 64  CALL INKIN(8884)  READ INPUT DATA FROM PR.DAT  READ (25.15) LY, LY, XO, YO, ACHA, ACHB  FORMAT(12F8.1, 2F8.6)  READ (25.15) NU, CHECAL, CHEGAZ, INC, Z, OMEGA  FORMAT(1F8.7, F8.1, 2E8.3, 2F8.2)  C COMPUTE THE VALUE OF PI  P1-2.0-aSIN(1.0)	
VARIABLE LIST  C DA - BENDING RIGIDITY OF THE FINITE PLATE C DB - BENDING RIGIDITY OF THE INFINITE PLATE C ETAA - DAMPING COEFICIENT FOR THE FINITE PLATE C ETAB = DAMPING COEFICIENT FOR THE INFINITE PLATE C LX 4 LY - DIMENSIONS OF THE FINITE PLATE C ROA - DENSITY OF THE INFINITE PLATE C ROB - DENSITY OF THE INFINITE PLATE C ACHA = THICKNESS OF THE FINITE PLATE C ACHB - THICKNESS OF THE INFINITE PLATE C RO - DENSITY OF FLUID C X0 4 YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED C Z - DISTANCE BETWEEN THE PLATES C PRA - PRANDEL NUMBER FOR FLUID C MU - VISCOSITY OF FLUID C MU - VISCOSITY OF FLUID C MU - VISCOSITY OF FLUID C MU - POISON'S RATIO C C - SPEED OF SOUND IN FLUID C MU - POISON'S RATIO C C - SPEED OF SOUND IN FLUID C EA - SHEER MODULUS OF THE INFINITE PLATE C EA - SHEER MODULUS OF THE INFINITE PLATE C EA - SHEER MODULUS OF THE INFINITE PLATE C EA - SHEER MODULUS OF THE INFINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F-1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1) OPEN (UNIT-25, FILE-'PRIDOO.DAT', STATUS-'OLD') OPEN (UNIT-26, FILE-'PRIDOO.DAT', STATUS-'NEW')  READ (25,15) LY, LY, XO, YO, ACHA, ACHB FORMAT(4P6.1, 2F6.6)  READ (25,25) ROA, ROB, RO, ETAA, ETAB, GAMMA, PRA PARAMETER (7-1, P8.1, 2F8.6) READ (25,25) NO, CAE, EB, KX1, KX1  35 FORMAT(12F8.1, 156.1, 18, F8.3, F12.3) C COMPUTE THE VALUE OF P1 P1-2.0-ASIN(1.0)  C COMPUTE THE VALUE OF P1 P1-2.0-ASIN(1.0)	
C DA - BENDING RIGIDITY OF THE FINITE PLATE  DB -BENDING RIGIDITY OF THE INFINITE PLATE  DE TAB - DAMPING COEFICIENT FOR THE INFINITE PLATE  C ETAB - DAMPING COEFICIENT FOR THE INFINITE PLATE  C ACIA - DENSITY OF THE FINITE PLATE  C ACIA - DENSITY OF THE FINITE PLATE  C ACIA - THICKNESS OF THE INFINITE PLATE  C ACIA - THICKNESS OF THE FINITE PLATE  C ACIA - THICKNESS OF THE INFINITE PLATE  C ACIA - THE PLATE OF THE FINITE PLATE  C ACIA - SPECIFIC HEAT RATIO FOR FLUID  MU - VISCOSITY OF FLUID  C ACIA - SPECIFIC HEAT RATIO FOR FLUID  MU - VISCOSITY OF THE INFINITE PLATE  C EA - SHEER MODULUS OF THE INFINITE PLATE  C KX1 - UPPER MAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  C XX1 - UPPER MAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F-1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-26, FILE-'PRILODO.OUT', STATUS-'OLD')  OPEN (UNIT-26, FILE-'PRILODO.OUT', STATUS-'OLD')  OPEN (UNIT-26, FILE-'PRILODO.OUT', STATUS-'NEW')  ANOTHER LIMES ON CAN BE LARGER THAN 64  CALL IMAIN(8084)  READ (25.15) LX, LY, XO, XO, ACHA, ACHB  FORMAT(F8.1, F8.6)  READ (25.25) ROA, ROB, RO, ETAA, ETAB, GAMMA, PRA  PEAD (25.25) ROA, ROB, RO, ETAA, ETAB, GAMMA, PRA  PORMAT(F8.1, F8.3, 2F8.7, 2F8.6)  READ (25.45) NU, CMEGAI, OMEGAZ, INC, Z, OMEGA  FORMAT(F8.4, F8.1, F16.1, 18, F8.3, F12.3)  C COMPUTE THE VALUE OF PI  P1-2.0-ASIAIN(1.0)  P1-2.0-A	
DA - BENDING RIGIDITY OF THE FINITE PLATE  C DB - BENDING RIGIDITY OF THE INFINITE PLATE  C ETAA - DAMPING COEFICIENT FOR THE FINITE PLATE  C ETAB - DAMPING COEFICIENT FOR THE FINITE PLATE  C ETAB - DAMPING COEFICIENT FOR THE INFINITE PLATE  C ROA - DENSITY OF THE FINITE PLATE  C ROB - DENSITY OF THE INFINITE PLATE  C ACIA = THICKNESS OF THE FINITE PLATE  C ACIA = THICKNESS OF THE FINITE PLATE  C ACIA = THICKNESS OF THE INFINITE PLATE  C ACIA = THICKNESS OF THE FINITE PLATE  C ACIA = THICKNESS OF THE FINITE PLATE  C AC = DENSITY OF FLUID  C	<b> </b>
C DA - BENDING RIGIDITY OF THE INFINITE PLATE  C DB -BENDING RIGIDITY OF THE INFINITE PLATE  C ETAA - DAMPING COEFICIENT FOR THE INFINITE PLATE  C ETAB = DAMPING COEFICIENT FOR THE INFINITE PLATE  C LX & LY - DIMENSIONS OF THE FINITE PLATE  C ROA - DENSITY OF THE FINITE PLATE  C ACIA = THICKNESS OF THE INFINITE PLATE  C ACIB = THICKNESS OF THE INFINITE PLATE  C RO - DENSITY OF FLUID  C C Q ENSITY OF FLUID  C C - SPECIE NUMBER FOR FLUID  C C - SPECIE OF SOUND IN THE INFINITE PLATE  C EA - SHEER MODULUS OF THE INFINITE PLATE  C EA - SHEER MODULUS OF THE INFINITE PLATE  C KX1 - UPPER WAVENUMBER LIHIT IN FINITE PLATE IN X DIR  C XY1 - UPPER WAVENUMBER LIHIT IN FINITE PLATE IN Y DIR  PARAMETER (F-1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-26, FILE-'PRILOGO.OUT', STATUS-'OLD')  OPEN (UNIT-26, FILE-'PRILOGO.OUT', STATUS-'NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL INKIN(8884)  READ (25,15) LX_LX_XO,YO,ACHA,ACHB  FORMAT(F8.1,F8.6)  READ (25,25) ROA,ROB,RO,ETAA,ETAB,GAMMA,PRA  PORMAT(F8.1,F8.3,2E8.3,2F8.2)  READ (25,45) NU,OMEGAL,OMEGA2,INC,Z,OMEGA  FORMAT(F8.7,F8.3,2E8.3,2F8.2)  C CMPUTE THE VALUE OF PI  P1-2.0*ASIM(1.0)	
C DB -BENDING RIGIDITY OF THE INFINITE PLATE  C ETAM - DAMPING COEFICIENT FOR THE FINITE PLATE  C ETAM - DAMPING COEFICIENT FOR THE INFINITE PLATE  C ROA - DENSITY OF THE FINITE PLATE  C ROA - DENSITY OF THE INFINITE PLATE  C ROB - DENSITY OF THE INFINITE PLATE  C ACHB - THICKNESS OF THE INFINITE PLATE  C ACHB - THICKNESS OF THE INFINITE PLATE  C RO = DENSITY OF FLUID  C NO & YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED  C Z - DISTANCE BETWEEN THE PLATES  C PRA - PRANDEL NUMBER FOR FLUID  C MU - VISCOSITY OF FLUID  C NU - POISON'S RATIO  C C - SPEED OF SOUND IN FLUID  C MU - POISON'S RATIO  C EA - SHEER MODULUS OF THE FINITE PLATE  C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE  C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR.  KY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F-1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-25, FILE-'PRILOOO.OUT', STATUS-'OLD')  OPEN (UNIT-26, FILE-'PRILOOO.OUT', STATUS-'NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL INKIN 8084)  READ (25,15) LX.LX.XO.YO.ACHA.ACHB  FORMAT(2F8.1,2F8.6)  READ (25,25) ROA.ROB.RO.FTAA.ETAB.GAMMA.PRA  PORMAT(2F8.2,F8.3,2F8.7,2F8.6)  READ (25,35) HU.C.EA.EB.KX1.KY1  35 FORMAT(2F8.2,F8.3,2F8.7,2F8.6)  READ (25,35) HU.C.EA.EB.KX1.KY1  FORMAT(2F8.7,F8.3,2E8.3,2F8.2)  READ (25,45) NU.OREGAL.ONEGAL.INC.Z.OMEGA  FORMAT(F8.7,F8.3,2E8.3,2F8.2)  PREAD (25,45) NU.OREGAL.ONEGAL.INC.Z.OMEGA  FORMAT(F8.7,F8.3,2E8.3,2F8.2)  PORMAT(F8.7,F8.3,2E8.3,2F8.2)  PORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)	<u>  C                                   </u>
CETAA - DAMPING COEFICIENT FOR THE FINITE PLATE  CETAB = DAMPING COEFICIENT FOR THE INFINITE PLATE  CETAB = DAMPING COEFICIENT FOR THE INFINITE PLATE  CENCE - DENSITY OF THE FINITE PLATE  CEROB - DENSITY OF THE FINITE PLATE  CEROB - DENSITY OF THE INFINITE PLATE  CEROB - DENSITY OF THE INFINITE PLATE  CEROB - DENSITY OF FLUID  CEROB - THICKNESS OF THE INFINITE PLATE  CEROB - DENSITY OF FLUID  CEROB - DENSITY OF FLUID  CEROB - THE POINT WHERE THE INPUT FORCE F IS APPLIED  CEROB - TRANCEL NUMBER FOR FLUID  CEROB - PRANCEL NUMBER FOR FLUID  CEROB - PRANCEL NUMBER FOR FLUID  CEROB - SHEER MODULUS OF THE FINITE PLATE  CEROB - SHEER MODULUS OF THE INFINITE PLATE  CEROB - SHEER MODULUS OF THE INFINITE PLATE  CEROB - SHEER MODULUS OF THE INFINITE PLATE  CEROB - SHEER WOUNT OF THE INFINITE PLATE IN Y DIR  CEROB - SHEER WOUNT OF THE SHIP PLATE IN Y DIR  CEROB - SHEER WOUNT OF THE SHIP PLATE IN Y DIR  CEROB - SHEER WOUNT OF THE SHIP PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-25, FILE-'PRIDOO.DAT', STATUS-'OLD')  OPEN (UNIT-25, FILE-'PRIDOO.DAT', STATUS-'OLD')  OPEN (UNIT-26, FILE-'PRIDOO.DAT', STATUS	
ETAB = DAMPING COEFICIENT FOR THE INFINITE PLATE  C	( <del></del>
C LX & LY - DIMENSIONS OF THE FINITE PLATE  C ROA - DENSITY OF THE INFINITE PLATE  C ROB - DENSITY OF THE INFINITE PLATE  C ACHB - THICKNESS OF THE FINITE PLATE  C ACHB - THICKNESS OF THE INFINITE PLATE  C RO - DENSITY OF FLUID  C XO & YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED  C Z - DISTANCE BETWEEN THE PLATES  C PRA - PRANDEL NUMBER FOR FLUID  C MU - VISCOSITY OF FLUID  C MU - VISCOSITY OF FLUID  C MU - POISON'S RATIO  C C - SPEED OF SOUND IN FLUID  C EA - SHEER MODULUS OF THE FINITE PLATE  C EB - SHEER MODULUS OF THE INFINITE PLATE  C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR  KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  C PARAMETER (F-1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-25, FILE-'PRIDOO.DAT', STATUS-'NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL IMKIN(8884)  READ (25,15) LX.LY.XO.YO.ACHA.ACHB  FORMAT(4F8.3,2F8.6)  READ (25,25) ROA.BOB.RO.ETAA.ETAB.GAMMA.PRA  FORMAT(4F8.3,2F8.6)  READ (25,25) MU.C.EA.EB.KX1.KX1  35 FORMAT(5F8.7,F8.3,2F8.3,2F8.2)  READ (25,55) NU.C.EA.EB.KX1.KX1  76 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  C COMPUTE THE VALUE OF P1  P1-2.0-ARSIN(1.0)	
C. ROB - DENSITY OF THE FINITE PLATE C. ROB - DENSITY OF THE INFINITE PLATE C. ACHB - THICKNESS OF THE FINITE PLATE C. ACHB - THICKNESS OF THE INFINITE PLATE C. ACHB - THICKNESS OF THE INFINITE PLATE C. RO = DENSITY OF FLUID C. XO & YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED C. Z. = DISTANCE BETWEEN THE PLATES C. PRA - PRANDEL NUMBER FOR FLUID C. GAMMA - SPECIFIC HEAT RATIO FOR FLUID C. NU = POISON'S RATIO C. C SPEED OF SOUND IN FLUID C. MU - VISCOSITY OF FLUID C. EA - SHEER MODULUS OF THE FINITE PLATE C. EA - SHEER MODULUS OF THE FINITE PLATE C. EX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C. XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE C. XY1 - UPPER WAVENUMBER C. XY1 - UPPER C. XY1 - VISITE C. XY1 -	
C ROB - DENSITY OF THE INFINITE PLATE  ACHB - THICKNESS OF THE FINITE PLATE  C ACHB - THICKNESS OF THE INFINITE PLATE  C ACHB - THICKNESS OF THE INFINITE PLATE  C RO - DENSITY OF FLUID  C XO & YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED  C Z - DISTANCE BETWEEN THE PLATES  C PRA - PRANDEL NUMBER FOR FLUID  C MU - VISCOSITY OF FLUID  C MU - VISCOSITY OF FLUID  C MU - POISON'S RATIO  C - SPEED OF SOUND IN FLUID  E A - SHEER MODULUS OF THE FINITE PLATE  C EB - SHEER MODULUS OF THE INFINITE PLATE  C KXI - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR  KXI - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F-1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-25, FILE-'PRILODO.CUT', STATUS-'NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL INKIN(8884)  READ (25.15) LX.LY.XO,YO,ACHA,ACHB  FORMAT(4F8.3,2F8.6)  READ (25.25) ROA,BOB,RO,ETAA,ETAB,GAMMA,PRA  FORMAT(7F8.7,F8.3,2F8.7,2F8.6)  READ (25.35) MU,C,EA,EB,KXI,KYI  35 FORMAT(F8.7,F8.3,2F8.3,2F8.3)  READ (25.45) NU,CMEGAI,OMEGAZ,INC,Z,OMEGA  45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  C CUPPUTE THE VALUE OF PI  P1-2.0-ASIN(1.0)	
ACHA = THICKNESS OF THE FINITE PLATE C ACHB = THICKNESS OF THE INFINITE PLATE C RO = DENSITY OF FLUID  XO 4 YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED C Z = DISTANCE BETWEEN THE PLATES  PRA - PRANDEL NUMBER FOR FLUID C GAMMA - SPECIFIC HEAT RATIO FOR FLUID C MU - VISCOSITY OF FLUID C NU = POISON'S RATIO C C - SPEED OF SOUND IN FLUID C EA - SHEER MODULUS OF THE FINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C XY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C NUMIT-25, FILE='PRIOOO.DAT', STATUS='OLD') OPEN (UNIT-26, FILE='PRIOOO.DAT', STATUS='OLD') OPEN (UNIT-26, FILE='PRIOOO.DAT', STATUS='NEW') ANOTHER LINE SO N CAN BE LARGER THAN 64 CALL HAMIN(8884) READ (25,15) LX.LX.O.YO.ACHA.ACHB S FORMAT(498.3.278.6) READ (25,25) ROA.BOB.RO.ETAA.ETAB.GAMMA.PRA PORMAT(578.3.278.3.278.7.278.6) READ (25,35) MU,C.EA.EB.KXI,KYI S FORMAT(578.7.78.3.288.3.278.2) READ (25,45) NU,C.EA.EB.KXI,KYI PRAMAT(FB.4.78.3.288.3.278.2) READ (25,45) NU,C.EA.EB.KXI,KYI PORMAT(FB.4.78.3.288.3.278.2) READ (25,45) NU,C.MEGAI,OMEGAZ.INC,Z,OMEGA PORMAT(FB.4.78.1.716.1.18,F8.3,F12.3) COMPUTE THE VALUE OF PI P1-2.0°ASIN(1.0)	
C ACHB - THICKNESS OF THE INFINITE PLATE  C RO - DENSITY OF FLUID  C XO 4 YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED  C Z - DISTANCE BETWEEN THE PLATES  C PRA - PRANDEL NUMBER FOR FLUID  C GAMMA - SPECIFIC HEAT RATIO FOR FLUID  C MU - VISCOSITY OF FLUID  C NU - POISON'S RATIO  C C - SPEED OF SOUND IN FLUID  EA - SHEER MODULUS OF THE FINITE PLATE  C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR.  C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F-1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-25, FILE-'PRIODO.DAT', STATUS-'OLD')  OPEN (UNIT-26, FILE-'PRIDOO.DAT', STATUS-'NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL INMIN(8884)  READ (25,15) LX,LX,XO,YO,ACHA,ACHB  15 FORMAT(478.3,278.6)  READ (25,25) ROA, ROB,RO,ETAA,ETAB,GAMMA,PRA  PORMAT(278.2,F8.3,278.7,278.6)  READ (25,35) MU,C.EA,EB,KXI,KYI  35 FORMAT(278.7,F8.3,288.3,278.2)  READ (25,45) NU,CMEGAL,OMEGA2,INC,Z,OMEGA  45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  P1-2.0**SIN(1.0)	
C. RO = DENSITY OF FLUID C XO & YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED C Z = DISTANCE BETWEEN THE PLATES C PRA - PRANDEL NUMBER FOR FLUID C GAMMA - SPECIFIC HEAT RATIO FOR FLUID C MU - VISCOSITY OF FLUID C NU = POISON'S RATIO C C - SPEED OF SOUND IN FLUID C EA - SHEER MODULUS OF THE FINITE PLATE C EB - SHEER MODULUS OF THE INFINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C KY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C KY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C HOPEN (UNIT-25, FILE='PRIO0O.DAT', STATUS='OLD') OPEN (UNIT-26, FILE='PRID0O.DAT', STATUS='OLD') OPEN (UNIT-26, FILE='PRID0O.OUT', STATUS='NEW') C ANOTHER LINE SO N CAN BE LARGER THAN 64 C CALL IWKIN(8884) C READ (25,15) LY, LY, XO, YO, ACHA, ACHB 15 FORMAT(4F8.3, 2F8.6) READ (25,25) ROA, ROB, RO, ETAA, ETAB, GAMMA, PRA 25 FORMAT(4F8.3, 2F8.6) READ (25,25) NU, C, EA, EB, KX1, KX1 35 FORMAT(F8.7, F8.3, 2F8.7, 2F8.6) READ (25,45) NU, CMEGA1, OMEGA2, INC, Z, OMEGA 45 FORMAT(F8.4, F8.1, F16.1, 18, F8.3, F12.3) C COMPUTE THE VALUE OF PI PI-2.0°ASIN(1.0)	
XO & YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED  Z = DISTANCE BETWEEN THE PLATES  PRA - PRANDEL NUMBER FOR FLUID  GAMMA - SPECIFIC HEAT RATIO FOR FLUID  MU - VISCOSITY OF FLUID  C NU - POISON'S RATIO  C C - SPEED OF SOUND IN FLUID  EA - SHEER MODULUS OF THE FINITE PLATE  EB - SHEER MODULUS OF THE INFINITE PLATE  KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR  KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F=1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT=25, FILE='PR1000.DAT', STATUS='OLD')  OPEN (UNIT=26, FILE='PRTL1000.CUT', STATUS='NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL LUKIN(N 8884)  READ (25.15) LX.LY.XO.YO.ACHA.ACHB  FORMAT(4P8.3,2F8.6)  READ (25.25) ROA.BOB.RO.ETAA.ETAB.GAMMA.PRA  FORMAT(2F8.2,F8.3,2F8.7,2F8.6)  READ (25.25) MU.C.EA.EB.KXI.KYI  SFORMAT(F8.4,F8.3,2E8.3,2F8.2)  READ (25.45) NU.CMEGA1,OMEGA2,INC.Z.OMEGA  45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  PI=2.0*ASIN(1.0)	
C 2 - DISTANCE BETWEEN THE PLATES C PRA - PRANDEL NUMBER FOR FLUID C GAMMA - SPECIFIC HEAT RATIO FOR FLUID C MU - VISCOSITY OF FLUID C NU = POISON'S RATIO C - SPEED OF SOUND IN FLUID C EA - SHEER MODULUS OF THE FINITE PLATE C EB - SHEER MODULUS OF THE INFINITE PLATE C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR C PARAMETER (F=1.0) INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1) OPEN (UNIT=25, FILE='PR1000.DAT', STATUS='OLD') OPEN (UNIT=26, FILE='PRTL1000.OUT', STATUS='NEW') ANOTHER LINE SO N CAN BE LARGER THAN 64 CALL IWKIN(8884) C READ INPUT DATA FROM PR.DAT READ (25,15) LX.LY.XO.YO.ACHA.ACHB 15 FORMAT(478.3,278.6) READ (25,25) ROA.BOB.RO.ETAA.ETAB.GAMMA.PRA 25 FORMAT(278.2,F8.3,278.7,278.6) READ (25,25) NU.C.EA.EB.KXI.KXI 36 FORMAT(F8.7,F8.3,228.3,278.2) READ (25,45) NU.CMEGAI.OMEGA2.INC.Z.OMEGA 47 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3) COMPUTE THE VALUE OF PI PI=2.0*ASIN(1.0)	
PRA - PRANDEL NUMBER FOR FLUID  GAMMA - SPECIFIC HEAT RATIO FOR FLUID  MU - VISCOSITY OF FLUID  C MU - POISON'S RATIO  C C - SPEED OF SOUND IN FLUID  EA - SHEER MODULUS OF THE FINITE PLATE  EB - SHEER MODULUS OF THE INFINITE PLATE  KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR  KY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F-1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-25, FILE-'PRIDOO.OUT', STATUS-'OLD')  OPEN (UNIT-26, FILE-'PRTLIOOO.OUT', STATUS-'NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL INXIN(8884)  READ (25,15) LY, XO, YO, ACHA, ACHB  FORMAT(4P8.3,2F8.6)  READ (25,25) ROA, BOB, RO, ETAA, ETAB, GAMMA, PRA  25 FORMAT(4P8.3,2F8.7,2F8.6)  READ (25,35) MU,C,EA,EB,KX1,KX1  35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)  READ (25,45) NU,CMEGA1,OMEGA2,INC,Z,OMEGA  45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  PI-2.0*ASIN(1.0)	
GAMMA - SPECIFIC HEAT RATIO FOR FLUID  MU - VISCOSITY OF FLUID  C NU = POISON'S RATIO  C C - SPEED OF SOUND IN FLUID  EA - SHEER MODULUS OF THE FINITE PLATE  EB - SHEER MODULUS OF THE INFINITE PLATE  EKX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR  KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F-1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-25, FILE-'PR1000.DAT', STATUS-'OLD')  OPEN (UNIT-26, FILE-'PRTL1000.CUT', STATUS-'NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL IWKIN(8884)  READ (25,15) LX.LY.XO.YO.ACHA.ACHB  FORMAT(4P8.3,2F8.6)  READ (25,25) ROA.BOB.RO.ETAA.ETAB.GAMMA.PRA  25 FORMAT(4P8.3,2F8.6)  READ (25,35) HU.C.EA.EB.KXI.KXI  35 FORMAT(7F8.7F8.3,2F8.7,2F8.6)  READ (25,45) NU.CMEGA1.OMEGA2.INC.Z.OMEGA  45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  PI-2.0*ASIN(1.0)	
MU - VISCOSITY OF FLUID  NU = POISON'S RATIO  C - SPEED OF SOUND IN FLUID  E A - SHEER MODULUS OF THE FINITE PLATE  EB - SHEER MODULUS OF THE INFINITE PLATE  KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR  KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F=1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-25, FILE-'PRIOOO.DAT', STATUS-'OLD')  OPEN (UNIT-26, FILE-'PRILIOO.GUT', STATUS-'NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL IMKIN(8884)  READ (25,15) LX.LY.XO.YO.ACHA.ACHB  FORMAT(4F8.1,2F8.6)  READ (25,25) ROA.BOB.RO.ETAA.ETAB.GAMMA.PRA  PORMAT(2F8.2,F8.3,2F8.7,2F8.6)  READ (25,35) MU.C.EA.EB.KX1.KX1  35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)  READ (25,45) NU.CMEGA1.OMEGA2.INC.Z.OMEGA  45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  P1-2.0*ASIN(1.0)	
NU = POISON'S RATIO  C - SPEED OF SOUND IN FLUID  EA - SHEER MODULUS OF THE FINITE PLATE  EB - SHEER MODULUS OF THE INFINITE PLATE  KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR  KY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F=1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT=25, FILE='PR1000.DAT', STATUS='OLD')  OPEN (UNIT=26, FILE='PRTL1000.OUT', STATUS='NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL IWKIN(8084)  READ INPUT DATA FROM PR.DAT  READ (25,15) LX,LX,XO,YO,ACHA,ACHB  15 FORMAT(4P8.3,2F8.6)  READ (25,25) ROA, ROB,RO,ETAA,ETAB,GAMMA,PRA  25 FORMAT(2F8.2,F8.3,2F8.7,2F8.6)  READ (25,35) MU,C.EA,EB,KX1,KY1  35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)  READ (25,45) NU,OMEGA1,OMEGA2,INC,Z,OMEGA  45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  P1=2.0*ASIN(1.0)	
C - SPEED OF SOUND IN FLUID  EA - SHEER MODULUS OF THE FINITE PLATE  EB - SHEER MODULUS OF THE INFINITE PLATE  KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR  KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F=1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT=25, FILE='PR1000.DAT', STATUS='OLD')  OPEN (UNIT=26, FILE='PRTL1000.CUT', STATUS='NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL IWKIN(8U84)  READ INPUT DATA FROM PR.DAT  READ (25,15) LX,LY,XO,YO,ACHA,ACHB  15 FORMAT(4P8.3,2F8.6)  READ (25,25) ROA,BOB,RO,ETAA,ETAB,GAMMA,PRA  25 FORMAT(2P8.3,2F8.6)  READ (25,35) MU,C.EA,EB,KX1,KY1  35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)  READ (25,45) NU,OMEGA1,OMEGA2,INC.Z,OMEGA  45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  P1=2.0*ASIN(1.0)	
EA - SHEER MODULUS OF THE FINITE PLATE  EB - SHEER MODULUS OF THE INFINITE PLATE  KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR  EXY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F=1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT=25, FILE='PR1000.DAT', STATUS='OLD')  OPEN (UNIT=26, FILE='PRTL1000.QUT', STATUS='NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL INKIN(BUB4)  READ (25,15) LX,LY,XO,YO,ACHA,ACHB  FORMAT(4F8.3,2F8.6)  READ (25,25) ROA,BOB,RO,ETAA,ETAB,GAMMA,PRA  FORMAT(2F8.2,F8.3,2F8.7,2F8.6)  READ (25,35) HU,C,EA,EB,KX1,KY1  35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)  READ (25,45) NU,CMEGAL,OMEGA2,INC,Z,OMEGA  FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  P1=2.0*ASIN(1.0)	
EB - SHEER MODULUS OF THE INFINITE PLATE  KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR  KY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F-1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-25, FILE-'PR1000.DAT', STATUS-'OLD')  OPEN (UNIT-26, FILE-'PRTL1000.CUT', STATUS-'NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL IWKIN(8884)  READ INPUT DATA FROM PR.DAT  READ (25,15) LX.LY.XO.YO.ACHA.ACHB  FORMAT(4F8.3,2F8.6)  READ (25,25) ROA.ROB.RO.ETAA.ETAB.GAMMA.PRA  25 FORMAT(2F8.2,F8.3,2F8.7,2F8.6)  READ (25,35) MU.C.EA.EB.KX1.KX1  35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)  READ (25,45) NU.OMEGA1.OMEGA2.INC.Z.OMEGA  FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  PI-2.0*ASIN(1.0)	• • • • • • • • • • • • • • • • • • • •
KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR  KY1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN Y DIR  PARAMETER (F=1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT=25, FILE='PR1000.DAT', STATUS='OLD')  OPEN (UNIT=26, FILE='PRTL1000.QUT', STATUS='NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL IWKIN(8U84)  READ INPUT DATA FROM PR.DAT  READ (25,15) LX,LY,XO,YO,ACHA,ACHB  FORMAT(4F8.3,2F8.6)  READ (25,25) ROA,BOB,RO,ETAA,ETAB,GAMMA,PRA  25 FORMAT(4F8.3,2F8.6)  READ (25,35) MU,C,EA,EB,KX1,KY1  35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)  READ (25,45) NU,OMEGA1,OMEGA2,INC,Z,OMEGA  45 FORMAT(F8.4,F8.1,F16.1,I8,F8.3,F12.3)  COMPUTE THE VALUE OF PI  PI=2.0*ASIN(1.0)	C EA - SHEER MODULUS OF THE FINITE PLATE
PARAMETER (F-1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-25, FILE-'PR1000.DAT', STATUS-'OLD')  OPEN (UNIT-26, FILE-'PR11000.CUT', STATUS-'NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL IWKIN(8884)  READ INPUT DATA FROM PR.DAT  READ (25,15) LY,LY,XO,YO,ACHA,ACHB  FORMAT(4P8.3,2F8.6)  READ (25,25) ROA,BOB,RO,ETAA,ETAB,GAMMA,PRA  25 FORMAT(2F8.2,F8.3,2F8.7,2F8.6)  READ (25,35) MU,C,EA,EB,KX1,KY1  35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)  READ (25,45) NU,CMEGA1,CMEGA2,INC,Z,CMEGA  45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  PI-2.0*ASIN(1.0)	C EB - SHEER MODULUS OF THE INFINITE PLATE
PARAMETER (F=1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE & UNIT FORCE (1)  OPEN (UNIT=25, FILE='PR1000.DAT', STATUS='OLD')  OPEN (UNIT=26, FILE='PRTL1000.GUT', STATUS='NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL IWKIN(8884)  READ INPUT DATA FROM PR.DAT  READ (25,15) LY.LY.XO.YO.ACHA.ACHB  15 FORMAT(4P8.3,2F8.6)  READ (25,25) ROA.BOB.RO.ETAA.ETAB.GAMMA.PRA  25 FORMAT(2F8.2,F8.3,2F8.7,2F8.6)  READ (25,35) MU.C.EA.EB.KX1.KY1  35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)  READ (25,45) NU.OMEGA1.OMEGA2.INC.Z.OMEGA  45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  PI=2.0*ASIN(1.0)	
PARAMETER (F-1.0)  INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)  OPEN (UNIT-25, FILE-'PR1000.DAT', STATUS-'OLD')  OPEN (UNIT-26, FILE-'PRTL1000.GUT', STATUS-'NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL IWKIN(8884)  READ INPUT DATA FROM PR.DAT  READ (25,15) LX.LY.XO.YO.ACHA.ACHB  15 FORMAT(4P8.3,2F8.6)  READ (25,25) ROA.BOB.RO.ETAA.ETAB.GAMMA.PRA  25 FORMAT(2F8.2,F8.3,2F8.7,2F8.6)  READ (25,35) MU.C.EA.EB.KX1.KX1  35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)  READ (25,45) NU.OMEGA1.OMEGA2.INC.Z.OMEGA  45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  PI-2.0*ASIN(1.0)	
INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE & UNIT FORCE (1)  OPEN (UNIT=25, FILE='PR1000.DAT', STATUS='OLD')  OPEN (UNIT=26, FILE='PRTL1000.CUT', STATUS='NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL IWKIN(8884)  READ INPUT DATA FROM PR.DAT  READ (25,15) LX.LY.XO.YO.ACHA.ACHB  FORMAT(4F8.3,2F8.6)  READ (25,25) ROA.BOB.RO.ETAA.ETAB.GAMMA.PRA  25 FORMAT(2F8.2,F8.3,2F8.7,2F8.6)  READ (25,35) MU.C.EA.EB.KX1.KX1  35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)  READ (25,45) NU.OMEGA1.OMEGA2.INC.Z.OMEGA  FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  PI=2.0*ASIN(1.0)	
OPEN (UNIT-25, FILE-'PR1000.DAT', STATUS-'OLD') OPEN (UNIT-26, FILE-'PRTL1000.CUT', STATUS-'NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64 CALL IWKIN(8884)  READ INPUT DATA FROM PR.DAT READ (25,15) LX.LY.XO.YO.ACHA.ACHB  FORMAT(4P8.3.2F8.6) READ (25,25) ROA.ROB.RO.ETAA.ETAB.GAMMA.PRA  25 FORMAT(2F8.2.F8.3.2F8.7.2F8.6) READ (25,35) MU.C.EA.EB.KX1.KX1  35 FORMAT(F8.7.F8.3.2E8.3.2F8.2) READ (25,45) NU.OMEGA1.OMEGA2.INC.Z.OMEGA FORMAT(F8.4.F8.1.F16.1.18,F8.3.F12.3)  COMPUTE THE VALUE OF PI PI-2.0*ASIN(1.0)	PARAMETER (F=1.0)
OPEN (UNIT-26, FILE-'PRTL1000.QUT', STATUS-'NEW')  ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL IWKIN(8884)  READ INPUT DATA FROM PR.DAT  READ (25,15) LX,LY,XO,YO,ACHA,ACHB  15 FORMAT(4P8.3,2F8.6)  READ (25,25) ROA,ROB,RO,ETAA,ETAB,GAMMA,PRA  25 FORMAT(2F8.2,F8.3,2F8.7,2F8.6)  READ (25,35) MU,C,EA,EB,KX1,KY1  35 FORMAT(F8.7,F8.3,2E8.3,2F9.2)  READ (25,45) NU,OMEGA1,OMEGA2,INC,Z,OMEGA  5 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  PI-2.0*ASIN(1.0)	C INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)
ANOTHER LINE SO N CAN BE LARGER THAN 64  CALL IWKIN(8884)  READ INPUT DATA FROM PR.DAT  READ (25,15) LX,LY,XO,YO,ACHA,ACHB  15 FORMAT(478.3,278.6)  READ (25,25) ROA,BOB,RO,ETAA,ETAB,GAMMA,PRA  25 FORMAT(278.2,78.3,278.7,278.6)  READ (25,35) MU,C,EA,EB,KX1,KY1  35 FORMAT(F8.7,F8.3,288.3,278.2)  READ (25,45) NU,OMEGA1,OMEGA2,INC,Z,OMEGA  45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  PI=2.0*ASIN(1.0)	OPEN (UNIT-25, FILE-'PRIUUU.DAT', STATUS-'OLD')
CALL IMKIN(8884)  READ INPUT DATA FROM PR.DAT  READ (25,15) LY,LY,XO,YO,ACHA,ACHB  15 FORMAT(478.3,2F8.6)  READ (25,25) ROA,BOB,RO,ETAA,ETAB,GAMMA,PRA  25 FORMAT(2F8.2,F8.3,2F8.7,2F8.6)  READ (25,35) MU,C,EA,EB,KX1,KY1  35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)  READ (25,45) NU,CMEGA1,CMEGA2,INC,Z,CMEGA  45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI  PI=2.0*ASIN(1.0)	OPEN (UNIT-26, FILE-'PRTL1000.OUT', STATUS-'NEW')
READ INPUT DATA FROM PR.DAT READ (25,15) LX,LY,XO,YO,ACHA,ACHB  15 FORMAT(4P8.3,2F8.6) READ (25,25) ROA,ROB,RO,ETAA,ETAB,GAMMA,PRA  25 FORMAT(2F8.2,F8.3,2F8.7,2F8.6) READ (25,35) MU,C,EA,EB,KX1,KY1  35 FORMAT(F8.7,F8.3,2E8.3,2F8.2) READ (25,45) NU,OMEGA1,OMEGA2,INC,Z,OMEGA  45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3) COMPUTE THE VALUE OF PI PI=2.0°ASIN(1.0)	
READ (25,15) LY,LY,XO,YO,ACHA,ACHB  15 FORMAT(4F8.3,2F8.6)     READ (25,25) ROA,BOB,RO,ETAA,ETAB,GAMMA,PRA  25 FORMAT(2F8.2,F8.3,2F8.7,2F8.6)     READ (25,35) MU,C,EA,EB,KX1,KY1  35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)     READ (25,45) NU,OMEGA1,OMEGA2,INC,Z,OMEGA  45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)  COMPUTE THE VALUE OF PI PI=2.0*ASIN(1.0)	
15 FORMAT (4P8.3,2F8.6) READ (25,25) ROA, BOB, RO, ETAA, ETAB, GAMMA, PRA 25 FORMAT (2F8.2,F8.3,2F8.7,2F8.6) READ (25,35) MU,C.EA,EB,KX1,KX1 35 FORMAT (F8.7,F8.3,2E8.3,2F8.2) READ (25,45) NU,OMEGA1,OMEGA2,INC,Z,OMEGA 45 FORMAT (F8.4,F8.1,F16.1,18,F8.3,F12.3) COMPUTE THE VALUE OF P1 P1=2.0*ASIN(1.0)	The state of the contract of t
READ (25,25) ROA, RÓB, RO, ETAA, ETAB, GAMMA, PRA  25 FORMAT(2F8.2, F8.3, 2F8.7, 2F8.6)  READ (25,35) MU,C, EA, EB, KX1, KX1  35 FORMAT(F8.7, F8.3, 2E8.3, 2F8.2)  READ (25,45) NU, OMEGA1, OMEGA2, INC, Z, OMEGA  45 FORMAT(F8.4, F8.1, F16.1, 18, F8.3, F12.3)  COMPUTE THE VALUE OF PI PI=2.0 ASIN(1.0)	
25 FORMAT(2F8.2,F8.3,2F8.7,2F8.6) READ (25,35) MU,C,EA,EB,KX1,KX1 35 FORMAT(F8.7,F8.3,2E8.3,2F8.2) READ (25,45) NU,OMEGA1,OMEGA2,INC,Z,OMEGA 45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3) COMPUTE THE VALUE OF PI PI=2.0*ASIN(1.0)	15 FORMAT (4P8. J. 4F8. 6)
READ (25,35) MU,C,EA,EB.KX1,KY1  35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)  READ (25,45) NU,CMEGA1,CMEGA2,INC,Z,CMEGA  45 FORMAT(F8.4,F8.1,F16.1,I8,F8.3,F12.3)  COMPUTE THE VALUE OF PI  PI=2.0*ASIN(1.0)	REAU (43,43) ROA, BUB, RO, ETAB, GATTA, PRA
35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)READ (25,45) NU,OMEGA1,OMEGA2,INC,Z,OMEGA 45 FORMAT(F8.4,F8.1,F16.1,I8,F8.3,F12.3) COMPUTE THE VALUE OF PI PI=2.0*ASIN(1.0)	43 FURNAL(4F0.4,F0.3,4F0./,4F0.0)
READ (25,45) NU, OMEGA1, OMEGA2, INC, Z, OMEGA  45 FORMAT(F8.4, F8.1, F16.1, I8, F8.3, F12.3)  COMPUTE THE VALUE OF PI P1-2.0°ASIN(1.0)	
45 FORMAT(F8.4,F8.1,F16.1,I8,F8.3,F12.3)  COMPUTE THE VALUE OF PI P1-2.0*ASIN(1.0)	JJ FUTURAL(FO.//FO.J/460.J/4FO.4) BORD /35 45\ NII OMFORD OMFORD THE V OMFORD
COMPUTE THE VALUE OF PI PI=2.0*ASIN(1.0)	AS ENDMANTED A PR 1 FIG 1 FIG 1 FIG 1 FIG 1
PI=2.0*ASIN(1.0)	
	The second of th

DA=(EA*ACHA**3.0)/(12.0*(1.0-NU**2.0))
DB=(EB*AGiB**3.0)/(12.0*(1.0~NU**2.0))
DSTAR-CMPLX(DA, DA ETAA)
MP-ROA*ACHA*LX*LY
WRITE(26,11) LX,LY
11 FORMAT( PARAMETERS OF FINITE PLATE', /, DIMENSIONS OF PLATE'
6, (LX) ',F8.3,' (LY) ',F8.3,' MCTERS')
1
WRITE(26,21) XQ,YQ   21 FORMAT(' DRIVING POINT XO ',F8.3,' YO ',F8.3,'
21 FORMAT(' DRIVING POINT XO ',FB.3,' YO ',FB.3,'
WRITE(26,31) F
31 FORMAT('DRIVING FORCE ',FB.3,'N')
WRITE(26,41)ACHA
41 FORMAT( PLATE THICKNESS ',FB.6,' M')
WRITE(26,51) ROA
51 FORMAT(! PLATE DENSITY ',F8.3,! KG/CU-METERS')
WRITE(26,61) EA
61 FORMAT( MODULUS OF ELASTICITY ,E8.3, N/SQ-METERS)
WRITE(26,71) DA
71 FORMAT( BENDING RIGIDITY , E12.4)
WRITE(26,81) ETAA
81 FORMAT( 'DAMPING COEFFICIENT', F8.4)
WRITE(26,91)
91 FORMAT(/, ' PARAMETERS OF INFINITE PLATE',/)
WRITE(26,101) ACHB
101 FORMAT( PLATE THICKNESS ',F8.6.' M')
WRITE(26,111) ROB
111 FORMAT('PLATE DENSITY ', F8.3, 'KG/CU-METERS')
WRITE(26,121) EB 121 FORMAT(' MODULUS OF ELASTICITY ',EB.3,' N/SQ-METERS')
WRITE(26,131) DB
131 FORMAT(' BENDING RIGIDITY ', E12.4)   WRITE(26,141) ETAB
141 FORMAT(' DAMPING COEFICIENT', F8.4)
WRITE(26,151) RO
151 FORMAT(/, PARAMETERS FOR FLUID',/, DENSITY ',F8.3,
&' KG/CU-METER')
CONTROL OF 161 VMI
161 FORMAT(' VISCOSITY ',F8.7,' KG/M-S')
/ ************************************
181 FORMAT(' SPEED OF SOUND ',F8.3,' M/S')
WPTTF/26.191\ PRA
191 FORMAT( ' PRANDTL NUMBER ', F8.3)
WRITE(26,201) GAMMA
201 FORMAT(' SPECIFIC HEAT RATIO ',F8.3)
WRITE(26.211) 2
211 FORMAT(' DISTANCE BETWEEN PLATES ',F8.3,' H')
C FREQUENCY IS TAKEN FROM 125 TO 1000 Hz
DO 1000 OMEGAI-21,30
OMEGA=2.0*PI*(10.0**(OMEGAI/10.0))
C THE LIMITS OF THE FFT. THE FFT IS TAKEN FROM -KX1/2.0 TO
C KX1/2.0 AND FROM -KY1/2.0 TO KY1/2.0
kx1-201.1
KY1=201.1
C THE SAMPLE SPACING IS HKX AND HKY
HKX-KX1/N
HKY-KY1/N
C PARAMETERS FOR FFT2B INVERSE FOURIER TRANSFORM SUBHOUTINE
NRCOEF-N
NCCOEF-N
LDCOEF-N
IDA-N
C INITIALIZATION ROUTINES FOR THE FFT
CALL FFTCI(N,WFF1)
C K IS THE WAVENUMBER IN THE FLUID
C to the state printer of the state of the s

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K-OMEGA/C
C_ KC IS THE COMPLEX WAVENUMBER
          KC=(K) *CMPLX(1.0, (OMEGA*MU*((4.0/3.0)+((GAMMA-1.0)/PRA)
      4)/(2.0*RO*C**2.0)))
C KP IS THE PLATE WAVENUMBER
         KP-(ROB*ACHB*OMEGA**2.0/DB) 32.25
C KPF IS THE COMPLEX PLATE WAVENUMBER ** 4.0
         KPF=(ROB*ACHB*OMEGA**2.0/DB)*CMPLX(1.0,ETAB)
          DO 100 I-1,N
          M, L=L 001 Q
          BT(I,J)=0.0
          0.0=(L,I)TA
 100
          CONTINUE
   OMEGAMNSUB CALCULATES THE UPPER AND LOVIER MODES NUP, NLO
          CALL OMEGAMNSUB(NLO, NUP, OMEGA, ROA, ACHA, DA, LX, LY)
   THE PLATE MODES ARE TAKEN FROM EM AND EN = NLO TO NUP
         DO 200 EM-NLO, NUP
          DO 200 EN-NLO, NUP
C OMEGANMSQ IS THE RESONANT OMEGA ** 2
         OMEGAMNSQ-DSTAR*((((2.0*EM+1.0)*PI/LX)**2.0+((2.0*EN+1.0)_____
      6*PI/LY)**2.0)**2.0)/(ROA*ACHA)
        KXM=((2.0*EM+1.0)*PI/LX)
KYN=((2.0*EN+1.0)*PI/LY)
C. COEFICIENT CALCULATES THE INPUT ARRAY TO THE FFT (COEF)_
      CALL COEFICIENT (N, HKX, HKY, KX1, KY1, PI, KXM, KYN, &K, KC, KPF, Z, KX, KY, LX, LY, EM, EN, COEF)
  FFT2B IS AN IMSL SUBROUTINE WHICH CALCULATES THE 2-D FFT OF
C A SET OF FOURIER COEFFICIENTS
C COEF(I,J) IS THE INPUT ARRAY
C A(I,J) IS THE OUTPUT ARRAY
CALL F2T2B (NRCOEF, NCCOEF, A, LDA, COEF, LDCOEF, WFF1, WFF2,
 ____ 6WC,CPY)
            DO 400 I=1,N
DO 400 J=1,N
            B(I,J)=A(I,J)
            B1(1,J)=(1.0/(2.0*PI)**2.0)*HKX*HKY*((-1)**I)*((-1)**I)...
      6*B(1,J)*(COS((2.0*EM+1.0)*PI*XO/LX)*COS((2.0*EN+1.0)
     &*PI:YO/LY)/(OMEGAMNSQ-OMEGA::2.0))
            BT(I,J)=BT(I,J)+Bl(I,J)
 400
            CONTINUE
 200
          CONTINUE
           DO 500 I=1,N
            DO 500 J-1,N 8
WB(I,J)=((-1.0)*F*RO*OMEGA**2.0*BT(I,J))/(MP*DB)
WBREAL(I,J)-WB(I,J)

C WBREAL(I,J) IS THE REAL PART OF THE PLATE-B RESPONSE

C WB(I,J) IS THE COMPLEX PLATE-B RESPONSE
 500
            CONTINUE
   THE FOLLOWING TWO DO-LOOPS CONVERT THE OUTPUT PLATE RESPONSE
   IN THE X-Y PLANE SO THAT THE RESPONSE SHOWS THE CENTER OF THE PLATE IN THE CENTER OF THE ARRAY
0000
                       4 | 3
                    3
c
                       2
Č
             DO 600 I=1,N
DO 600 J=1.N/2
             TEMP-WBREAL(I,J)
             WBREAL(I,J)-WDREAL(I,N/2+J)
             WBREAL(I,N/2+J)-TEMP
             CONTINUE
 600
            DO 700 J-1,N
DO 700 I-1,N/2
```

TEMP-WBREAL(I,J)
WBREAL(I,J)-WBREAL(N/2+I,J)
WBREAL(N/2+I,J)-TEMP
HDREAL(H/ZTI/O)-1MIP
700CONTINUE
AMPB=0.0
COUNT=0.0
C CALCULATE THE AMPLITUDE OF VIBRATION IN THE PORTION OF THE PLATE
C SHAPOWED BY THE UPPER PLATE
DO 800 I=(N/2)-(KX1*LX/(4.0*PI)),(N/2)+(KX1*LX/(4.0*PI))
DO 800 J=(N/2)-(KY1*LY/(4.0*PI)),(N/2)+(KY1*LY/(4.0*PI))
AMPB=AMPB+WBREAL(I,J)**2.0
COUNT-COUNT+1.0
800 CONTINUE
C AMPB IS THE SUM OF THE SQUARES OF THE PLATE RESPONSE OF THE AREA
C OF PLATE B SHADOWED BY PLATE A
C AMPTE IS AMPE DIVIDED BY THE NUMBER OF POINTS
AMPTB-AMPB/COUNT
C CALCULATE THE YIBRATION RESPONSE OF PLATE A
DO 250 EM-NLO, NUP
DO 250 EN-NIO, NUP
OMEGAMNSQ-DSTAR*((((2.0*EM+1.0)*PI/LX)**2.0+((2.0*EN+1.0)
CTECHNIQUEST (((a.o.m) - 1.0/-1.0/((a.o.m)
6*PI/LY)**2.0)**2.0)/(ROA*ACHA)
DO 450 I=1,N
DO 450 J=1, N
X = (-LX/2.0) + (LX*(I-1))/N
Y=(-LY/2.0)+(LY=(J-1))/N
$A(I,J)=(\cos((2.0*EM+1.0)*PI*XO/LX))*(\cos((2.0*EM+1.0))$
4*PI*YO/LY))*(COS((2.0*EM+1.0)*PI*X/LX))*(COS((2.0*EN+1.0)
6*PI*Y/LY))/(OMEGAMNSQ-OMEGA**2.0)
AT(I,J)=AT(I,J)+A(I,J)
450 CONTINUE
**:
250 CONTINUE
MPA=0.0
COUNT=0.0
DO 550 I=1,N
WA(I,J)=(4.0*F/MP)*AT(I,J)
WAREAL(I.J)=WA(I.J)
C WAREAL IS THE REAL PART OF THE PLATE RESPONSE OF PLATE A
C WA IS THE COMPLEX PLATE RESPONSE OF PLATE A
AMPA-AMPA+WAREAL(I,J)==2.0
COUNT-COUNT+1.0
550 CONTINUE
AMPTA-AMPA/COUNT
AMERICAN CONTROL OF THE DIAME PRODUCE OF A LANG.
C AMPA IS THE SUM OF THE SQUARES OF THE PLATE RESPONSE OVER PLATE A
C AMPTA IS AMPA DIVIDED BY THE NUMBER OF POINTS
WRITE (26,321) AMPTA,AMPTB
C_OUTPUT AMPTA AND AMPTB
321 FORMAT (25x, 'AMPTA- ',E12.6, 'AMPTB- ',E12.6)
C_THE FOLLOWING IF STATEMENT TESTS IF AMPTE IS TOO SMALL
IF(AMPTB.LE.(10.0**(-90.0)))GO TO 650
TAU-AMPTB/AMPTA
AND THE IN THE TOTAL TOPE
C CALCULATE TRANSMISSION LOSS
TL(OMEGAI)=10.0*(ALOG10(1.0/TAU))
X1 (OMEGAI)—FLOAT (OMEGAI)
C OUTPUT TRANSMISSION LOSS
WRITE(26,311)OMEGA/(2.0°PI),TL(OMEGAI)
311 FORMAT(F12.2,10x,F6.2)
COTO 1000
650 TL(OMEGAI)=101.0
HRITE(26,311)OMEGA/(2.0°PI),TL(OMEGAI)
1000 CONTINUE.
END
C
SUBROUTINE COEFICIENT (N, HKX, HKY, KX1, KY1, PI, KXM, KYN,
4K, KC, KPF, Z, KX, KY, LX, LY, EM, EN, COEF)

C COEFICIENT CALCULATES THE FOURIER COEFICIENTS FOR USE IN THE
C FFT2B SUBROUTINE
REAL KX(N), KY(N), IMN, HKX, HKY, PI, KX1, KY1,  6KYM, KYN, Z, LX, LY, K
INTEGER EM, EN, N
COMPLEX TEMP, KC, KPF, COEF(N, N)
DO 10 I-1,N
C THE FFT USES THE INTERVAL FROM -KX1/2.0 TO KX1/2.0
C AND -KY1/2.0 TO KY1/2.0
$KX(1)=((1-1)^{2}HKX)-(KX1/2.0)$
KY(J) = ((J-1) *HKY) - (KY1/2.0)
C THE FOLLOWING IF STATEMENTS DETERMINE IMN
_ IF ((KXM**2.0 .EQ. KX(I)**2.0).AND. {(KYN**2.0 .EQ. KY(J)**2.0))
6(KIN-12:0 : EQ. KI(0) - 2:0))
IF ((KXM**2.0 .EQ. KX(I)**2.0).AND.
£(XYN=2.0 ,NE. XY(J)=2.0))
6 IMN=LX*KYN*COS(KY(J)*LY/2.0)*(-1.0)**EN/
6(KYN**2.0-KY(J)**2.0) IF ((KXM**2.0 .NE. KX(I)**2.0).AND.
6(KYN:2.0 EO. KY(J):2.0))
&IMN-LY*KXM*COS(KX(I)*LX/2.0)*(-1.0)**EM/
6(KXM::2.0-KX(I)::2.0)
IF ((KXM==2.0 .NE. KX(I)==2.0).AND.
6(KYNT=2.0 .NE. KY(J)=2.0)) 6IMN=4.0*KXM*KYN*COS(KX(I)*LX/2.0)*
SCOS(KY(J)*LY/2.0)*(-1.0)**EM*(-1.0)**EN/
&((KXM**2.0-KX(I)**2.0)*(KYN**2.0-
6KY(J)**2.0))
C THE FOLLOWING IF-STATEMENT TESTS IF THE EXPRESSION IS
C_ NEGATIVE FOR USE IN THE COMPLEX EXXPRESSION FOR COEF(I,J)
IF (K**2.0-KY(I)**2.0-KY(J)
55 TEMP=CMPLX(((ABS(K**2.0-KX(I)**2.0-
6KY(J)::2.0))::.5):(-Z),0.0)
GOTO 75
65 TEMP=CMPLX(0.0,((K**2.0-KX(I)**2.0-
6KY(J)**2.0)**0.5)*2)  75
C CALCULATE COEF
COEF(I.J)=CEXP(TEMP)*IMN/
&((KC**2.0-KX(I)**2.0-KY(J)**2.0)**.5*
6((KX(I)**2.0+KY(J)**2.0)**2.0-KPF))
10 CONTINUE RETURN
END
lc
SUBROUTINE OMEGAMNSUB(NLO, NUP, OMEGA, ROA, ACHA, DA, LY, LY)
C OMEGAMNSUB COMPUTES THE LIPPER AND LOWER MODES WHICH THE PLATE C RESPONSE IS SUMMED OVER. NLO IS THE LOWER LIMIT AND NUP IS THE
C RESPONSE IS SUMMED OVER. NLO IS THE LOWER LIMIT AND NUP IS THE
INTEGER NIO.NUP.N11
REAL OMEGA, ROA, ACHA, DA, LY, LY, OMEGAMNO, OMEGAMNI, OMEGAMNZ, PI
PI=2.0*ASIN(1.0)
C INITIALIZE AND INCREMENT NUP
158 NIO=NIO+1
C CALCULATE RESONANT OMEGA FOR THE EN-NIO, EM-NLO MODE
OMEGAMNO-(DA/(ROA*ACHA))**.5*(((2.0*NLO+1.0)*PI/LX)**2.0
4+((2.0*NLO+1.0)*PI/LY)**2.0) C_IF THIS RESONANT OMEGA IS LARGER THAN OMEGA GO ON TO 258
C IF NOT INCREMENT NLO AND REPEAT
IF (OMEGAMNO.GT.OMEGA) GOTO 258
GOTÓ 158
C INITIALIZE AND INCREMENT NUP

258 NUP-1
C CALCULATE THE RESONANT OMEGAS FOR EN-NUP, EM-0 AND EN-0, EM-NUP
C_MODES_AND_TEST_IF_LARGER_THAN_OMEGA
OMEGAMN1=(DA/(ROA=ACHA))==.5=(((2.0=NUP+1.0)=PI/LX)==2.0
6+(PI/LY)**2.0)
OMEGAMN2=(DA/(ROA=ACHA))==.5=((PI/LX)==2.0 6+((2.0=NUP+1.0)=PI/LY)==2.0)
C IF LARGER THAN OMEGA GO ON TO 458 IF NOT INCREMENT NUP , REPEAT
IF((OMEGAMN1.GT.OMEGA).OR.(OMEGAMN2.GT.OMEGA)) GOTO 458
GOTO 358
C ADD THREE MODES TO UPPER LIMIT
NUP=NUP+3
N11-NLO C_SUBTRACT THREE MODES FROM THE LOWER LIMIT, ZERO IS THE LOWEST_NLO
NIO-NIO-3
IF(N11.EQ.0) NLQ=0
IF(N11.EQ.1) NLO=0
IF(N11.EQ.2) NIO-0   WRITE (6,558) NIO, NUP
RETURN
END

PROGRAM PRILIOO
C DETERMINES THE TRANSMISSION LOSS BETWEEN PLATE-A AND PLATE-B
C USING RMS VIBRATION LEVELS OF EACH PLATE
lc
C WRITTEN BY MICHAEL F. SHAW
<u> </u>
INTEGER OMEGAI, OMEGAB, OMEGAT, INC, EM, EN, I, J,
ANRCOEF, NCCOEF, LDCOEF, LDA, N, NLO, NUP, N11
PARAMETER (N-64)
COMPLEX DSTAR, OMEGAMNSQ, COEF(N, N), A(N, N), B1(N, N),
<b>&amp;BT(N,N),KPF,KC,WA(N,N),WB(N,N),AT(N,N),B(N,N),</b>
6RC(N,N)
REAL WFF1(4*N+15), WFF2(4*N+15), CPY(N,N)
REAL WEET (4-N+13), WEEZ (4-N+13), CF1 (N,N)
REAL WBREAL(N,N), WAREAL(N,N), WORK1(4000), WORK2(100),
EAMPA, AMPB, TAU, TL(200), COUNT, OMEGAL, OMEGA2, X1(200), OMEGART
REAL DA.DB.ETAA.ETAB.LY.LY.ROA.ROB.ACHA.ACHB.KX(N),KY(N),
&KX1, KY1, KXM, KYN, F, RO, MP, XO, YO, IMN, Z, PRA, GAMMA, MU, NU, C, E,
eral, all, am, alle, ao, ile, ao, ile, ao, ile, ao, ao, ao, ao, ao, ao, ao, ao, ao, ao
4HKX,HKY,PI,K,KP,OMEGA,OMEGAMNO,OMEGAMN1,OMEGAMN2
INTRINSIC CMPLX
EXTERNAL F2T2B, FFTCI
C THE NEXT TWO LINES ALLOW N TO BE LARGER THAN 64 POINTS
COMMON /WORKSP/ RWKSP
REAL RWKSP(8884)
<u>C</u>
C VARIABLE LIST
<u>C</u>
C DA - BENDING RIGIDITY OF THE FINITE PLATE
C DB -BENDING RIGIDITY OF THE INFINITE PLATE
C ETAA - DAMPING COEFICIENT FOR THE FINITE PLATE
Table bolinaria area and are area area area.
CETAB - DAMPING COEFICITIT FOR THE INFINITE PLATE
C LX & LY - DIMENSIONS OF THE FINITE PLATE
C ROA = DENSITY OF THE FINITE PLATE
C ROB - DENSITY OF THE INFINITE PLATE
To the first the
C ACHB - THICKNESS OF THE INFINITE PLATE
C RO - DENSITY OF FLUID
C XO & YO - THE POINT WHERE THE INPUT FORCE F IS APPLIED
C PRA - PRANDEL NUMBER FOR FLUID
CGAMMA - SPECIFIC HEAT RATIO FOR FLUID
C MU - VISCOSITY OF FLUID
C C - SPEED OF SOUND IN FLUID
C EA = SHEER MODULUS OF THE FINITE PLATE
C EB - SHEER MODULUS OF THE INFINITE PLATE
C KX1 - UPPER WAVENUMBER LIMIT IN FINITE PLATE IN X DIR
The same and the s
C - executation and an analysis and an analysi
PARAMETER (F-1.0)
C INPUT FORCE TO THE FINITE PLATE IS ASSUMED TO BE A UNIT FORCE (1)
OPEN (UNIT-25, FILE-'PRIOO.DAT', STATUS-'OLD')
OPEN (UNIT-25, FILE- PRIOR DATE)
OPEN (UNIT-26, FILE-'PRTL100.OUT', STATUS-'NEW')
C ANOTHER LINE SO N CAN BE LARGER THAN 64
CALL IWKIN(8884)
C READ INPUT DATA FROM PR.DAT
READ (25,15) LX,LY,XO,YO,AGIA,AGIB
15 FORMAT(4F8.3,2F8.6)
READ (25,25) ROA, ROB, RO, ETAB, GAMMA, PRA
25 FORMAT(2F8.2,F8.3,2F8.7,2F8.6)
READ (25,35) MU,C,EA,EB,KX1,KY1
35 FORMAT(F8.7,F8.3,2E8.3,2F8.2)
READ (25.45) NU.OMEGAL.OMEGA2.INC.Z.OMEGA
45 FORMAT(F8.4,F8.1,F16.1,18,F8.3,F12.3)
To complime the true of the complete of the co
C COMPUTE THE VALUE OF PI
PI-2.0*ASIN(1.0)
C COMPUTE THE BENDING RIGIDITIES
C COMPUTE THE BENDING MIGIDITIES

DA=(EA*ACHA**3.0)/(12.0*(1.0-NU**2.0))
DB=(EB*ACHB*:3.0)/(12.0*(1.0-NU**2.0))
DSTAR-CMPLX(DA,DA*ETAA)
MP=ROA*ACHA*LX*LY
WRITE(25,11) LX,LY
11 FORMAT(! PARAMETERS OF FINITE PLATE', /, DIMENSIONS OF PLATE!
6,' (LX) ',F8.3,' (LY) ',F8.3,' METERS')
WRITE(26,21) XO, YO
21 FORMAT(' DRIVING POINT XO ',F8.3,' YO ',F8.3,'
write(26,31) F
31 FORMAT( DRIVING TORCE ',FB.2,' N')
WRITE(26,41)ACIA
41 FORMAT(! PLATE THICKNESS !,FB.6, M')
WRITE(26,51) ROA
51FORMAT(' PLATE DENSITY ',F8.3,'_ KG/CU-METERS')
WRITE(26,61) EA
61 FORMAT( ! MODULUS OF ELASTICITY !,EB.3, ! N/SQ-METERS!)
WRITE(26,71) DA
71 FORMAT( BENDING RIGIDITY ',E12.4)
WRITE(26,81) ETAA
B1 FORMAT(' DAMPING COEFFICIENT', FB.4)
WRITE(26,91) 91 FORMAT(/,' PARAMETERS OF INFINITE PLATE',/)
91 FORMAT(/, PARAMETERS OF INFINITE PLATE',/) WRITE(26,101) ACHB
101 FORMAT(' PLATE THICKNESS ',F8.6,' M')
WRITE(26,111) ROB
111 FORMAT(' PLATE DENSITY ',F8.3,' KG/CU-METERS')
WRITE(26,121) EB
121 FORMAT( 'MODULUS OF ELASTICITY ',E8.3,' N/SO-METERS')
WRITE(26,131) DB
131 FORMAT( BENDING RIGIDITY ',E12.4)
WRITE(26,141) ETAB
141 FORMAT( DAMPING COEFICIENT', FB.4)
WRITE(26,151) RO
151 FORMAT (/. PARAMETERS FOR FLUID'./, DENSITY ',F8.3,
190 mm 196 3 63 1 100
161 FORMAT(' VISCOSITY ',F8.7,' KG/M-S')
WRITE(26,181) C
181 FORMAT(' SPEED OF SOUND ',F8.3,' M/S')
WRTTE/26 191) PRA
191 FORMAT(' PRANDTL NUMBER ',F8.3)
WRITE(26,201) GAMMA
201 FORMAT(' SPECIFIC HEAT RATIO ',F8.3)
WRITE(26.211) Z
211 FORMAT(' DISTANCE BETWEEN PLATES ',F8.3,' M')
C THE THEORY AND TO STATE THE TOTAL TO THE TOTAL TOTAL TOTAL THE TOTAL T
C THE FREQUENCY RANGE IS TAKEN FROM 10 TO 100 Hz
WRITE(26,301) 301 FORMAT(' FREQUENCY (HZ) TRANSMISSION LOSS ')
DO 1000 OMEGAI=10,20 OMEGA=2.0*PI*(10.0**(OMEGAI/10.0))
C KX1 AND KY1 ARE
C THE LIMITS OF THE FFT. THE FFT IS TAKEN FROM -KX1/2.0 TO
C_KX1/2.0 AND FROM -KY1/2.0 TO KY1/2.0
KX1-62.9
XX1=62.9
C THE SAMPLE SPACING IS HKX AND HKY
HKY-KY1/N
CPARAMETERS FOR FET2B INVERSE FOURIER TRANSFORM SUBROUTINE
NRODEF-N
LDOOFF-N
LDA-N

```
C INITIALIZATION ROUTINES FOR THE FFT
   _ ... CALL FFTCI(N, WEF1) .
         CALL FFTCI(N, WFF2)
 C. K IS THE WAVENUMBER IN THE FLUID
         K-OMEGA/C
 C KC IS THE COMPLEX WAVENUMBER
         KC=(K)=CMPLX(1.0, (OMEGA=MU=((4.0/3.0)+((GAMMA-1.0)/PRA)
      4)/(2.0*RO*C**2.0)))
 C KP IS THE PLATE WAVENUMBER
         KP=(ROB*ACHB*OMEGA**2.0/DB)**.25
 C KPF IS THE COMPLEX PLATE WAVENUMBER ** 4.0
      KPF-(ROB*ACHB*OMEGG:*2.0/DB)*CMPLX(1.0,ETAB)
         DO 100 I-1.N
         DO 100 J-1,N
         BT(I,J)=0.0
         AT(I,J)-0.0
 100
         CONTINUE
  OMEGAMNSUB CALCULATES THE UPPER AND LOVER MODES NUP, NLO
         CALL OMEGAMNSUB(NLO, NUP, OMEGA, ROA, ACHA, DA, LX, LY)
 C. THE PLATE MODES ARE TAKEN FROM EM AND EN - NLO TO NUP
         DO 200 EM-NLO, NUP
         DO 200 EN-NLO, NUP
 C OMEGANMSQ IS THE RESONANT OMEGA ** 2
         OMEGAMNSQ=DSTAR*((((2.0*EM+1.0)*PI/LX)**2.0+((2.0*EN+1.0)
      4=PI/LY) == 2.0) == 2.0) / (ROA=ACHA)
         KXM=((2.0*EM+1.0)*PI/LX)
         KYN=((2.0*EN+1.0)*PI/LY)
C COEFICIENT CALCULATES THE INPUT ARRAY TO THE FFT (COEF)
         CALL COEFICIENT (N, HKX, HKY, KX1, KY1, PI, KXM, KYN,
      &K, KC, KPF, Z, KX, KY, LX, LY, EM, EN, COEF)
  FFT2B IS AN IMSL SUBROUTINE WHICH CALCULATES THE 2-D FFT OF
C A SET OF FOURIER COEFFICIENTS
C COEF(I,J) IS THE INPUT ARRAY
C A(I,J) IS THE OUTPUT ARRAY
C_ A(I,J)
         CALL F2T2B (NRCOSF, NCCOEF, A, LDA, COEF, LDCOEF, WFF1, WFF2,
     AWC, CPY)
           DO 400 I=1,N
DO 400 J=1,N
           B(I,J)=A(I,J)
           Bl(I,J)=(1.0/(2.0*PI)**2.0)*HKX*HKY*((-1)**I)*((-1)**J)
     6=B(I,J)=(COS((2.0=EM+1.0)=PI=XO/LX)=COS((2.0=EN+1.0)
     L=PI=YO/LY)/(OMEGAMNSQ-OMEGA==2.0))
           BT(I,J)=BT(I,J)+Bl(I,J)
           CONTINUE
 400
 200
         CONTINUE
          DO 500 I-1,N
          DO 500 I=1,N 8

DO 500 J=1,N 8

WB(I,J)=((-1.0)*F*RO*OMEGA**2.0*BT(I,J))/(MP*DB)

WBREAL(I,J)=WB(I,J)
C WBREAL(I,J) IS THE REAL PART OF THE PLATE-B RESPONSE ______
C WB(I,J) IS THE COMPLEX PLATE-B RESPONSE
  WB(I,J)
CONTINUE
 500
C THE FOLLOWING TWO DO-LOOPS CONVERT THE OUTPUT PLATE RESPONSE
C. IN THE X-Y PLANE SO THAT THE RESPONSE SHOWS THE CENTER OF THE C PLATE IN THE CENTER OF THE ARRAY
000
                  3 4 3
                             4
C. .
č
           DO 600 I-1,N
           DO 600 J-1,N/2
           TEMP-WBREAL(I,J)
           WBREAL(I,J)-WBREAL(I,N/2+J)
```

	WBREAL(I,N/2+J)=TEMP	
600	CONTINUE	
ł	DO 700 J=1, N	
	DO 700 I=1,N/2TEMP=WBREAL(I,J)	<del></del>
Į.	WBREAL(I,J)-WBREAL(N/2+I,J)	
	WBREAL(N/2+I,J)=TEMP	
700	CONTINUE	
	MPB=0.0	· <del></del>
	DUNT-0.0	
C CALCUI	ATE THE AMPLITUDE OF VIBRATION IN THE PORTION OF THE	PLATE
C _ SHADOV	ED BY THE UPPER PLATE	
ŀ	DO 800 $I=(N/2)-(KX1*LX/(4.0*PI)), (N/2)+(KX1*LX/(4.0*PI))$	
	_DO.800.J=(N/2)-(KYl*LY/(4.0*PI)),(N/2)+(KYl*LY/(4.0* NMPB-AMPB+WBREAL(I,J)**2.0	EL) }
	COUNT-COUNT+1.0	
800	CONTINUE	
	IS THE SUM OF THE SQUARES OF THE PLATE RESPONSE OF THE	E AREA
	TE B SHADOWED BY PLATE A	
	IS AMPE DIVIDED BY THE NUMBER OF POINTS	
	MPTB=AMPB/COUNT	i
	ATE THE VIBRATION RESPONSE OF PLATE A	
	0 250 EN=NIO, NUP	
	MEGAMNSQ=DSTAR*((((2.0*EM+1.0)*PI/LX)**2.0+((2.0*EN+)	.01
£ PI	/LY) = #2.0) # #2.0) / (ROA * ACHA)	
	DO 450 I=1,N	
J	_DO_450_J=1,N	
	X=(-LX/2.0)+(LX*(I-1))/N	
	Y=(-LY/2.0)+(LY*(J-1))/N A(I,J)=(COS((2.0*EM+1.0)*PI*XO/LX))*(COS((2.0*EN+1.0)*PI*XO/LX)*(COS((2.0*EN+1.0)*PI*XO/LX)*(COS((2.0*EN+1.0)*PI*XO/LX)*(COS((2.0*EN+1.0)*PI*XO/LX)*(COS((2.0*EN+1.0)*PI*XO/LX)*(COS((2.0*EN+1.	
£*PT	#YO/LY)) #(COS((2.0 *EM+1.0) *PI #X/LX)) #(COS((2.0 *EM+1.0)	
	*Y/LY))/(OMEGAMNSQ-OMEGA**2.0)	
	AT(I,J)=AT(I,J)+A(I,J)	
450	CONTINUE	
	ONTINUE	
	MPA=0.0 OUNT=0.0	
	DO 550 I-1.N	
	DO 550 J=1,N	
	WA(I,J)=(4.0*F/MP)*AT(I,J)	
	WAREAL(I,J)=WA(I,J)	
	IS THE REAL PART OF THE PLATE RESPONSE OF PLATE A	
	THE COMPLEX PLATE RESPONSE OF PLATE A	
	OUNT=COUNT+1.0	i i
550	CONTINUE	
	MPTA-AMPA/COUNT	
C AMPA I	S THE SUM OF THE SQUARES OF THE PLATE RESPONSE OVER P	LATE A
	IS AMPA DIVIDED BY THE NUMBER OF POINTS	
	RITE (26,321) AMPTA,AMPTB AMPTA AND AMPTB	
321 F	ORMAT (25X, AMPTA- ',E12.6, AMPTB- ',E12.6)	<del></del>
C_THE FOI	LIOWING IF STATEMENT TESTS IF AMPTH IS TOO SMALL	
II	F(AMPTB.LE.(10.0**(-90.0)))GO TO 650	
	AU-AMPTB/AMPTA	
	ATE TRANSMISSION LOSS	
	.(OMEGAI)=10.01(ALOG10(1.0/TAU))	
	TRANSMISSION LOSS	
HER.	rite(26,311)omega/(2.0+PI),tl(omegai)	
311R	RMAT(F12.2,10X,F6.2)	
	7TO 1000	j
	(OMEGAI)=101.0	
	NTINUE	

```
END
          SUBROUTINE COEFICIENT (N,HKX,HKY,KX1,KY1,PI,KXM,KYN,
       4K, KC, KPF, Z, KX, KY, LX, LY, EM, EN, COEF)
    COEFICIENT CALCULATES THE FOURIER COEFICIENTS FOR USE IN THE
 C_ FFT2B SUBROUTINE
          REAL KX(N), KY(N), IMN, HKX, HKY, PI, KX1, KY1,
      EKXM, KYN, Z, LX, LY, K
          INTEGER EM, EN, N
          COMPLEX TEMP, KC, KPF, COEF(N, N)
          DO 10 I-1,N
DO 10 J=1,N
C THE FFT USES THE INTERVAL FROM -KX1/2.0 TO KX1/2.0
C AND -KY1/2.0 TO KY1/2.0
          KX(I)=((I-1)=HKX)=(KX1/2.0)
          KY(J) = ((J-1) * IIKY) - (KY1/2.0)
C THE FOLLOWING IF STATEMENTS DETERMINE IMN
         IF ((KXM**2.0 .EQ. KX(I)**2.0).AND.
      6(KYN**2.0 .EQ. KY(J)**2.0))
      &IMN-LX=LY/4.0
         IF ((KXM**2.0 .EQ. KX(I)**2.0).AND.
      6(KYN**2.0 NE. KY(J)**2.0))
      61MN-LX*KYN*COS(KY(J)*LY/2.0)*(-1.0)**EN/
      &(KYN**2.0-KY(J)**2.0)
          IF ((KXM**2.0 .NE. KX(I)**2.0).AND.
      E(KYN = 2.0 .EQ. KY(J) = 2.0))
      &IMN=LY*KXM*COS(KX(I)*LX/2.0)*(-1.0)**EM/
      £(KXM**2.0-KX(I)**2.0)
          IF ((KXM**2.0 .NE. KX(I)**2.0).AND.
      £(KYN=22.0_.NE. KY(J)=2.0))
£IMN=4.0*KXM*KYN*COS(KX(I)=LX/2.0)=
      £COS(KY(J)*LY/2.0)*(-1.0)**EM*(-1.0)**EN/
£((KXM**2.0-KX(I)**2.0)*(KYN**2.0-
      £KY(J)**2.0))
C THE FOLLOWING IF-STATEMENT TESTS IF THE EXPRESSION IS
  NEGATIVE FOR USE IN THE COMPLEX EXXPRESSION FOR COEF(I,J)
         IF (K**2.0-KX(I)**2.0-KY(J)
      £##2.0) 55, 65, 65
 55
         TEMP=CMPLX(((ABS(K**2.0-KX(I)**2.0-
  = \epsilon KY(J) = 2.0) = 0.5 = (-2), 0.0)
         GOTO 75
         TEMP=CMPLX(0.0,((K:2.0-KX(I)**2.0-
 .65
      &KY(J)**2.0)**0.5)*2)
        CONTINUE
C CALCULATE COEF
         COEF(I,J)=CEXP(TEMP)*IMN/
      &((KC**2.0-KX(I)**2.0-KY(J)**2.0)**.5*
     &((KX(I) **2.0+KY(J) **2.0) **2.0-KPF))
 10
         CONTINUE
         RETURN
         END
         SUBROUTINE OMEGAMNSUB (NLO. NUP, OMEGA, ROA, ACHA. DA, LX, LY)
C. OMEGAMNSUB COMPUTES THE UPPER AND LOWER MODES WHICH THE PLATE
  RESPONSE IS SUMMED OVER. NLO IS THE LOWER LIMIT AND NUP IS THE
C_ UPPER LIMIT.
         INTEGER NLO, NUP, N11
         REAL OMEGA, ROA, ACHA, DA, LX.LY, OMEGAMNO, OMEGAMNI, OMEGAMNI, PI
         PI=2.0=ASIN(1.0)
C_ INITIALIZE AND INCREMENT NUP
        NLO--1
        NLO-NLO+1
  CALCULATE RESONANT OMEGA FOR THE EN-NLO, EM-NLO MODE
  ___ CMEGANNO-(DA/(ROA-ACHA))**.5*(((2.0*NLO+1.0)*PI/LX)**2.0
4+((2.0*NLO+1.0)*PI/LY)**2.0)
IF THIS RESONANT OMEGA IS LARGER THAN OMEGA GO ON TO 258
```

C IF NOT INCREMENT NLO AND REPEAT
IE (OMEGAMNO.GT.OMEGA) GOTO 258
GOTO 158
C INITIALIZE AND INCREMENT NUP
258   NUP-1   358   NUP-NUP+1
C CALCULATE THE RESONANT OMEGAS FOR EN-NUP, EM-O AND EN-O, EM-NUP
C MODES AND TEST IF LARGER THAN OMEGA
OMEGAMN1=(DA/(ROA*ACHA))**.5*(((2.0*NUP+1.0)*PI/LX)**2.0
OMEGAMN2-(DA/(ROA*ACHA))**.5*((PI/LX)**2.0
L+((2.0:NUP+1.0):PI/LY):=2.0)  C IF LARGER THAN OMEGA GO ON TO 458 IF NOT INCREMENT NUP, REPEAT
IF ((OMEGAMN1.GT. OMEGA).OR. (OMEGAMN2.GT. OMEGA)) GOTO 458
GOTO 358
458 CONTINUE
C ADD THREE MODES TO UPPER LIMIT
N11=NLO
C SUBTRACT THREE MODES FROM THE LOWER LIMIT, ZERO IS THE LOWEST NIO
NIO-NIO-3
IE(N11.EQ.0) NIO=0
IF(N11.EQ.1) NLO=0 
WRITE (6.558) NIO.NUP
RETURN
END
·

## Sample Input

1.000 1.000 0.000 0.0000.0015870.001587 7860.0007860.000 1.204 0.10000 0.10000 1.4000 .706 .0000184 343.000 200.0E9 200.0E9 402.1 402.1 0.2900 10.0 10000.0 1 0.100 21020.0